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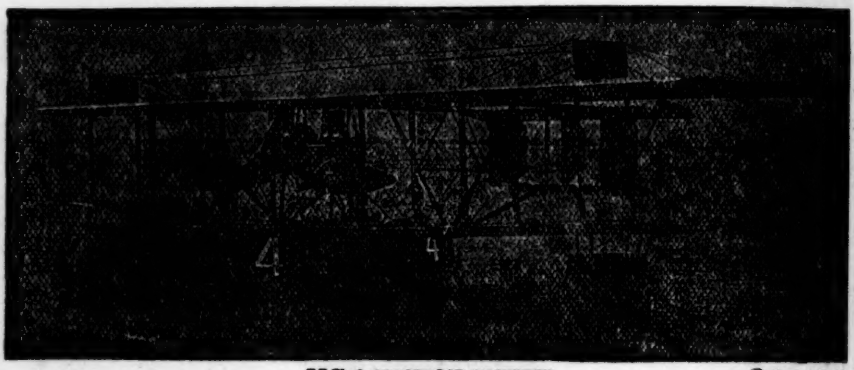

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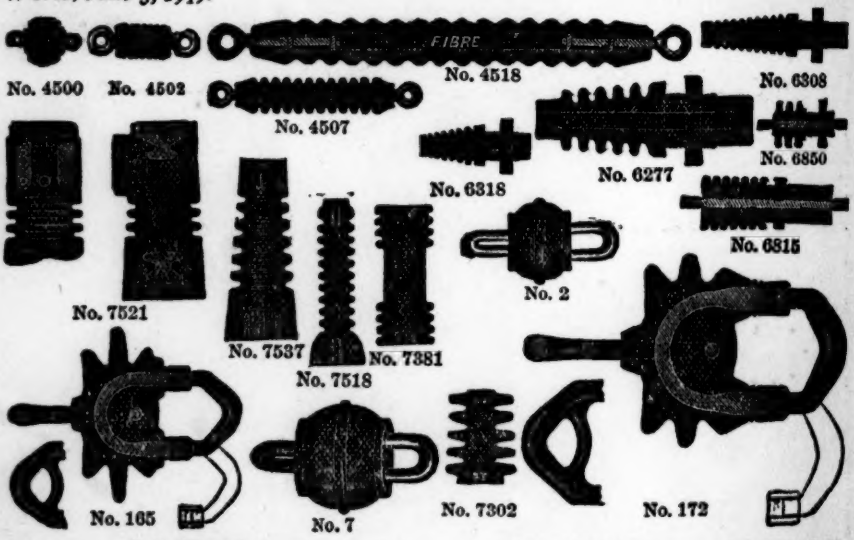

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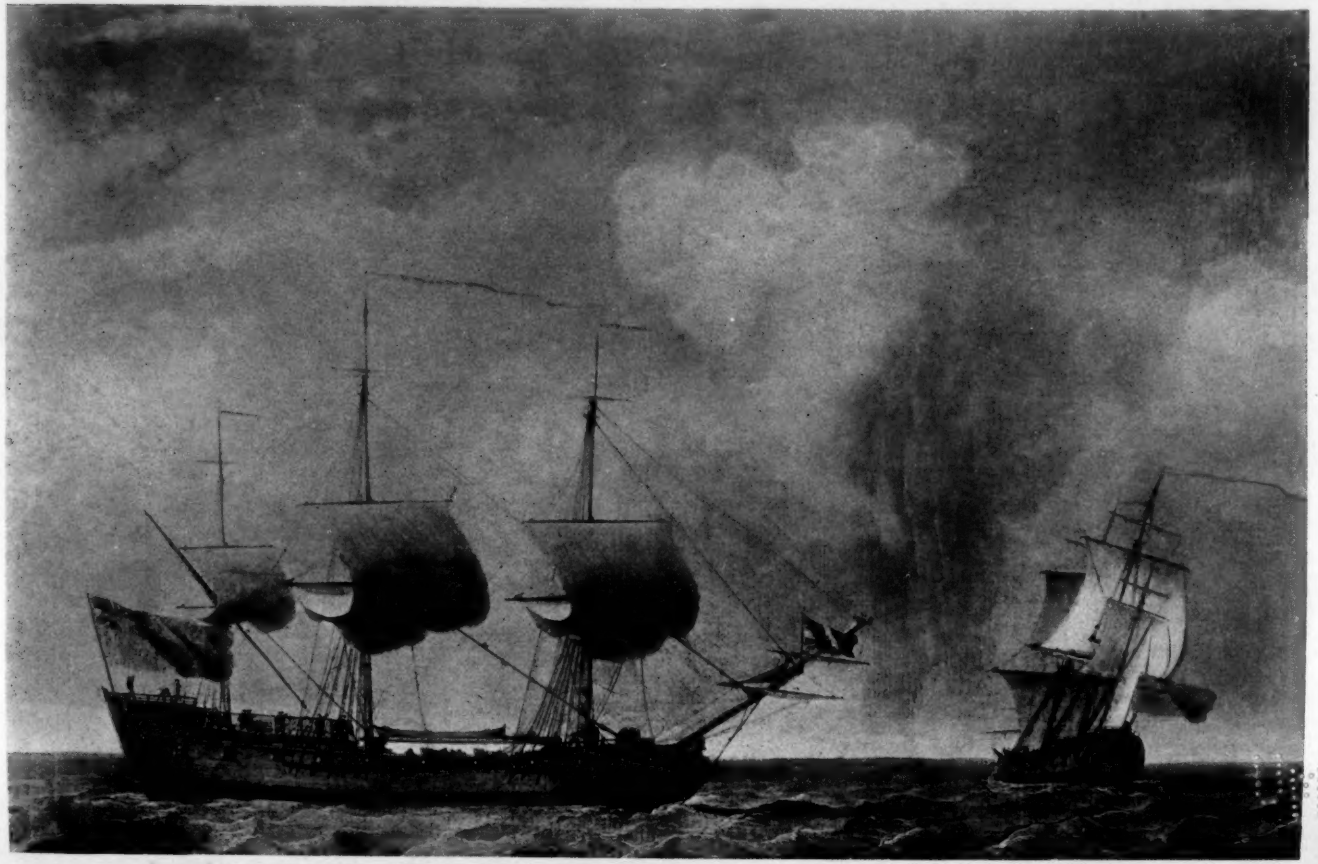

SHIP *BETHEL*, OF BOSTON, 14 GUNS, LETTER OF MARQUE, ISAAC FREEMAN, MASTER.

In 1748 this ship, carrying only 14 guns and 37 men, captured the Spanish ship *Jesu Maria and Joseph*, 26 guns, 110 men, a prize from which over $300,000 was realized. From the picture painted at the time in the possession of the Massachusetts Historical Society, reproduced by courtesy of the Society. The details of this exploit are given in an article by T. G. Frothingham.

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OFFICER PERSONNEL OF THE NAVY
RETROSPECTIVE AND PROSPECTIVE

By CAPTAIN HARRIS LANING, U. S. Navy

It is doubtful if among its sins of omission and commission the United States has any that is more glaring from a naval point of view than its neglect to provide in time of peace sufficient properly trained personnel to man and operate its fleets in war. Year after year we have seen the navy grow in a material way and to some extent the personnel has been increased, but there has never been any relation between the material increases and the increases of personnel. Even in the increases in personnel those pertaining to officers have progressed much less favorably, than those for enlisted men, the climax of the situation being reached about the time we declared war with Germany.

The fundamental reason for our lack of provision for personnel lies largely in our not having clear-cut national policies. With clear-cut national policies we could determine with considerable exactitude what military and naval strength we require to support them, and knowing that strength the personnel required for it would not only be easily determined but also would certainly be provided. As things are our naval strength is always a matter of chance, subject to the moods of a Congress that has no actual national policy to sustain and therefore cannot possibly know the needs of a navy required to sustain it.

Strange as it may seem the country at large and even Congress counts our naval strength in ships without considering for a moment whether or not the ships we have built or are building can be manned. The country is fed up by the press on the number of ships we have in the various classes and naturally believes that those ships are each and every one ready for war service. The people little realize that while billions have been spent for ships, insufficient laws have been made to provide the personnel to fight them and the necessary millions have not been appropriated to pay for the personnel that is just as necessary as ships, if ships are to fight.

The navy is not without blame for allowing this condition to come about. We ourselves have not advocated personnel as strongly as we have advocated material. When building programs were recommended practically nothing was mentioned about personnel yet the two recommendations should have gone hand in hand because each is worthless without the other. This attitude on the part of the navy was probably born of a desire to not ask for too large appropriations. In the cry for economy we have been afraid to insist on the great additional expense of commensurate personnel. We thought that having ships the personnel must necessarily be provided, but Congress finding that it could get credit for providing a large navy by merely providing ships was content to let it go at that and the matter not being forced to their attention it seems probable that they have not really understood the situation.

So long has the navy kept the personnel side in the background that now it is almost impossible to have legislators see it in its true light. The whole cry has been ships until the navy has come to mean only ships, and now that the Bureau of Navigation is striving to bring the personnel strength up to our ship strength they are finding it very difficult to get attention and still more difficult to get action on the navy's most vital need. The fact that the navy efficiently performed the part in the war it was called on to perform has kept alive the idea that all was well with us and that no change from old conditions is necessary. It is not generally understood that there might have been a different result had we been called on actually to fight from the very start.

It is one part of our preparation to have material but the vital thing is to have the trained personnel to get the maximum efficiency

from that material. As a matter of fact, of the two, personnel is the more vital for it is only by the personnel becoming skilled in naval warfare that they are able to determine what material is needed. The sound way to develop our navy is to supply personnel for the material we now have and then require the personnel to use the material and practice not only gunnery and engineering but also the strategy and tactics of naval warfare on a modern scale. As the personnel practices and trains in war games, maneuvers, gunnery, etc., it will ascertain the defects in material and methods; it will develop gunnery and engineering; it will suggest changes in types of craft; it will know the numbers of the various types required for a properly balanced fleet. Being skilled in strategy and tactics it will not advocate one type of ship to the exclusion of others but will advocate and get the proper number of each type; and as it progresses in the knowledge of naval war it will develop new material to meet new conditions that arise as we become more and more expert.

We have not a well-balanced navy to-day. Our battle line is good, and our destroyer force is large, but eyes and ears we have none and it is hard to see how we can get big results with what we have because our security and information service is so weak. And the reason it is weak is because of lack of personnel. Instead of having personnel versed in the use of all types of naval craft we have personnel versed only in the types we have been able to man. Being short in personnel what we have is overworked on their individual tasks and has very little time to study the broad problems of the navy. The result is that our broad problems do not receive the attention they should have. We have concentrated on gunnery and engineering, which are of course fundamental and vital, and we must continue to keep them on their present high planes, but we have not developed our strategy or tactics and our failure to do so has resulted in our not fully appreciating the necessity of having ships of all types and in the quantity we should have. We ourselves have not known and insisted on these types. What we have concentrated on we have developed wonderfully well, but continuing to do well in these things we must still go in for the development of the navy as a whole, never forgetting for one instant that as we develop our material we must also develop our personnel.

Not only have we been handicapped in the proper development of the navy as a whole by our lack of personnel in the past, but also we have not acquired the efficiency in the ships we have manned that we should have had. As we see the situation to-day we have not been fully ready either for peace or for war time operations. It was so essential to keep up the semblance of *fighting* strength that in the years just prior to the war we concentrated our personnel on battleships and destroyers and then spread it so thinly in order to man more ships that even the ships of those classes that we did man were not in all respects ready for war—at least not ready for war under the conditions it is waged to-day. We camouflaged our condition by calling the complements we gave them "peace complements" but at the same time we had no provision for changing those complements to "war complements." We *now* know that our so-called "peace complements" could not hope to fight those ships in an efficient manner because a ship's fighting team must be complete and every man in it fully trained long before war is declared. We can as sensibly train eight men for a foot ball team and increase the number to eleven the day of the big game as we can train a "peace complement" and increase it to a "war complement" at the time of battle. We would not run the risk of losing a sporting event by any such foolish action but we have and did run the risk of *national disaster* by just that same foolishness. In fact the conditions have been so bad in the last few years that we were not ready even to protect the national interests or even to show the flag in comparatively minor emergencies because in order incompletely to man *some* of our best fighting types we had to leave our gun boats, cruisers, etc., unmanned.

The effects of insufficient personnel are more far reaching than I can go into in this paper, but there are two branches of our naval effort that practically failed of development because of it. These are the submarine and aviation branches. Both the submarine and aeroplane are American inventions and each has come to be a vital factor in naval warfare, but while we led in inventing these marvelous machines we have only been straggling followers in using them for war purposes because we never could spare personnel in sufficient numbers to develop them. Had we had the personnel for those branches their developent by our navy would have been certain but as it was we got nowhere with them and it was our enemy who used our inventions most successfully in this war.

When war was declared, the situation we were in with regard to personnel, both men and officers, was truly deplorable. Not only were we lacking some of the vital types of ships, but what we had were not manned to fight to their maximum power. Both conditions were the indirect or direct result of the personnel situation, the former because our scant personnel was too overworked to ascertain and insist on all the types of ships needed, the latter because we tried to man more ships than our number would allow us to man. At the same time that the war started, a tremendous increase in material came to us. Thousands of enlisted men came in and had to be trained, and shore activity multiplied over and over again. Each required officers and there were none available. When we actually needed about 7000 line officers trained in all phases of modern naval warfare we had only 2394, and of these the number that had prepared themselves to handle *big* war problems was small. It was difficult to get the officers who were fully trained for *high command,* but infinitely more difficult to supply trained officers for subordinate places. Officers for high command duties did exist, but the thousands of trained officers needed in subordinate positions did not. *They* had to be created.

Fortunately for the United States the fighting did not come to this side. Had it done so when the war first started we would have been in a precarious condition. We could get along with the officers we had for the top places, but we had only enough officers to supply the "top" personnel. There was almost none for the bottom places. At that time the Bureau of Navigation had a momentous decision to make. The Office of the Chief of Naval Operations was making plans for a naval war on a large scale and the material bureaus began to turn out material for those plans in enormous amounts. Personnel to use it did not exist, but still the plans progressed and the material came on—transports, sub-chasers, destroyers, yachts, trawlers, submarines, aeroplanes, dirigibles, listening devices, guns, mines and so on *ad infinitum.* The material was good and all was needed for use against the enemy but it all called for trained men and officers that were not at hand.

The decision the Bureau of Navigation had to make was whether it would make it the policy to man merely what it had the personnel ready for or would adopt a plan to manufacture personnel as the material was manufactured and to finally supply

personnel for everything that came forth. If we limited ourselves to what we could man with the personnel we had, our part in the war would have been small but if we could find a way to man all that could be turned out we would ultimately have a navy of overwhelming power. Had the enemy been at our doors we would have been forced to adopt the smaller of the policies. The enemy, however, had a weakness and that was his inability to bring the fighting to us or to our coast. The Bureau taking advantage of that weakness and trusting in our allies to continue to hold the enemy, decided to adopt the policy of doing the big thing and finally to have personnel for that huge naval force that would certainly crush the Hun.

The Bureau's plan as adopted was to man efficiently all the craft we sent to the war zone, even at the expense of heavier craft remaining over here, and to train officers as fast as possible to fill the vacancies on ships not at the front. It made it a policy to rob ships that would not be fighting very soon to supply personnel for those that would. Craft to drive down the submarines, to transport troops, to protect convoys, etc., were in urgent demand and such craft were put in service at once and were well manned, but the battleships and other types that were not immediately needed were stripped of trained officers. Everywhere on shore and at sea intensive training of "officer material" was started and when it became known throughout the service that our ability to fight with our full strength was dependent on the success of that training, and that until every ship or station had trained up officers to fill its vacancies it would be valueless, the navy made up its mind to make that training a success and did make it so.

You who read this article are more or less familiar with the details of the training, development, and assignment of the thousands of officers the navy made during the war under that plan. The work of training and developing was trying and often nerve-racking, especially as it had to be carried on at the same time as the arduous work of war operations, but it was well done and ultimately, though many months after the war started, the navy had enough officers to permit it to fight to its maximum strength. It must not be supposed, however, that merely "enough officers" meets the navy's need. "Enough officers" made it possible for us to fight, but they are not the all-around officers we should have to develop and build up a navy. They are officers who can become

all-around officers in time and some have done so. As a rule, the duties these young and new officers could perform efficiently were limited, but because they learned to perform those limited duties well, the navy at last became ready to fight.

The war is now over and the personnel that came in for it is almost entirely gone. Thousands of the young men who came to us and who have been trained for officers have left us. There were many who were willing to stay in the navy and these with many others could have stayed with us to the great advantage of the navy and country. The navy needs officers and needs them by the thousands. We have to-day only about 2900 officers permanently commissioned in the line while for the permanent "authorized strength" alone we require 5499 permanent officers. However, the permanent authorized strength is altogether too small to man properly the number of ships the Chief of Naval Operations wants to keep manned in the future. For the first time that we can recall, the Bureau of Navigation has been given the number of ships that it is desirable to keep in commission. Heretofore the Bureau has merely manned what it could—now it is told how many ships of each type it must man. This at last gives the Bureau a plan to work on and the problem is definitely before it. To man those ships as they should be manned calls for a permanent authorized strength of 217,000 men and the line officers to go with them, 4 per cent of 217,000, a total of 8680 officers of the line. Actually the bureau finds that we should have 8716 line officers for the ships to be manned at this time, but as before stated we have less than 3000 permanent commissioned officers to meet that demand.

In making an estimate of this deficit of officers and in reaching a decision as to what it should do to meet it, the Bureau of Navigation realized that to wait until the Naval Academy could increase the number of officers by about 6000 might prove fatal. Even with the present large classes we cannot get from the academy a *net gain* of 400 per year. It will take the academy at least sixteen years to fill our *present* shortage, and any appreciable growth in the navy in that time will delay it by that much. Even the present three year building program was not considered in the above shortage, nor was any new building program given consideration. As a matter of fact, it appears to the Bureau that with the academy working to capacity at least 20 years must elapse before our navy

will have adequate officer personnel if we depend on the academy alone to supply the shortage.

The bureau felt that it would be neither wise nor safe to postpone our readiness for so long and has sought ways to provide immediately sufficient officers to keep the navy ready to fight if it should be called on. Excepting the academy there is only one source of supply quickly available and that source is the temporary and reserve officers trained during the war. The Bureau quite realizes that such officers have not acquired *all* the naval knowledge that academy officers have, but they can become very good officers, for all that, and certainly could tide us over another emergency as they have the present one.

Unless it has many more officers than it now has, the navy will not be ready to fight for years. By taking in a sufficient number from those temporarily with us during the war, we can keep fairly ready for war, and it is essential that we keep ready, for it is not likely that the next war will give us an ally that can hold the enemy off while we take time to build up our personnel. It is evident that we should obtain permanently for the service a goodly number of the officers who have already been trained at such effort and cost and the Bureau therefore decided to make the effort to get as many from the temporary and reserve officers as possible.

Prior to the adjournment of the last Congress on the 4th of March, the bureau officers went before it and stated the navy's case as to personnel. It was explained how 217,000 men are required for the navy's permanent strength if the Chief of Naval Operations plans, as to ships manned are carried out. It was shown that for his plans 8716 line officers are required. The Bureau submitted carefully drawn legislation, whereby the navy would have that permanent strength of 217,000 and whereby reserve officers who would otherwise be released when the national emergency ceases to exist, and temporary officers who would otherwise go out six months after the treaty of peace was signed, could be retained indefinitely, with their own consent, thus giving them ample time to prepare and qualify for permanent commissions. The proposed legislation further provided that the reserve and temporary officers, if they qualified by examination, could be permanently commissioned in the navy in the same *relative* standing they then held. The number that could come in under the Bureau's legislation was purposely not fixed further than it could

not exceed the number allowed for the authorized strength. The Bureau wanted all to come in that could qualify, well realizing that at best we would not get anything like the number needed and that the Naval Academy would still continue to be taxed for many years to bring the officer personnel of the navy up to the strength required to keep its material efficient and ready for war.

The legislation proposed by the Bureau is very broad in its scope. It applies to all corps and will permit each to take its qualified officers in permanently. It will not restrict any officers from coming in provided they can qualify. While no specific mention was made of it, the suggested legislation provided for the future of aviation in the navy since it will permit the Naval Reserve Flying corps, or class 5 of the Naval Reserve Force, to qualify and become officers of the regular line. The Bureau of Navigation is of the opinion that unless the regular line of the navy develops aeronautics just as it develops submarines, destroyers, or any other naval weapon there will be no real naval aviation. Officers in *naval* aviation must primarily be naval officers, and naval officers if they are to develop, operate, and use all the weapons at their disposal must have a knowledge of aviation as well as a knowledge of surface and subsurface craft. Aviation has placed at the navy's disposal another weapon to be co-ordinated with our older weapons and unless we are to repeat our submarine failure of the past we must recognize and develop the new weapon given us by aviation.

It has been said that aviation is a specialty, but so is the operation of every other weapon we use and we must know the strategy and tactics as well as the capabilities and limitations of all our weapons although we may not specialize in each of them. Naval aviation development of the future, and naval aviation craft with their tactics and strategy of to-day, are bound up inseparably with our other naval types and until we officers realize that aviation is merely a new member of the naval team, to be developed and used with the other members, we will get nowhere with it. It may be that fighting air craft will spell the doom of surface and subsurface fighting craft, but to do so the air craft personnel must know surface craft strategy and tactics to be able to combat them and possibly defeat them. On the other hand the surface craft personnel must know air craft strategy and tactics or lose the benefits to be derived from the greatest invention of modern warfare.

The naval bill as it passed the House, prior to the adjournment of March 4, did not give us the personnel legislation the Bureau of Navigation asked for, so when that bill went to the Senate the Secretary of the Navy asked that the Bureau's ideas be, in general, adopted excepting in regard to the total *authorized* strength, which instead of being set at 217,000 was to be left at its present permanent strength of 131,000, but increased *temporarily*, until July 1, 1920, to 250,000. The bill as reported to the Senate by the naval committee largely followed those ideas. In the Senate bill, the *permanent* authorized strength was not increased but remained at 131,485 plus 6000 apprentices and firemen under training. This would have permitted us, when we could get them, to have only 5499 permanent line officers. The temporary enlisted strength to be retained until June 30, 1920, was set at 250,000, but officers, permanent and temporary combined, were limited by the terms of the bill to the number required for 181,485 or a *total* of only 7259 officers, of whom at least 2000 were to be "temporary officers." There is already a law providing that in time of peace reserve officers who have been confirmed in their rank may with their own consent be employed afloat, and such officers can be utilized to cover the deficiency in officers between the number allowed for 181,485 and the number required for 250,000 men, should the Senate bill ever become a law.

The great difference between the Bureau's legislation and that finally reported by the Senate Committee lies in the number of officers that can come permanently into the line. As previously stated the Bureau asked that all be commissioned who could qualify. The House limited the number to 700 and specified how many were to come in *in each grade*. *Limiting* the number that can come in makes coming in permanently a matter of competition and the adding of a clause specifying the number that can come in *in each grade* made the law practically impossible to carry out. The Senate Committee continued the number of officers that could come in at 700 but bettered matters somewhat by cutting out the part specifying the number that were to come in in each grade. The Senate Committee also made two specific additions; *first*, one allowing chief warrant officers of 15 years' service to be commissioned without examination in their present relative temporary position (which will add 388 to the 700 officers that can come in) and *second*, specifically authorizing the taking in, in the

permanent line of the navy, of 500 officers of the Naval Reserve Flying Corps, provided they qualify for line duties. If the personnel bill that is ultimately passed takes the form of the bill proposed by the Senate Committee during the last session, we will get all told, from temporary and reserve officers, some 1588 additional permanent commissioned line officers. That number is of course utterly insufficient to meet our huge shortage but it is decidedly better than what the House bill provided. While it will do a great deal for aviation it will leave the navy inadequately officered in other branches for many years, but it would be at least a step in the right direction.

Assuming the ultimate passage of legislation similar to that reported to the Senate by the Senate Naval Committee during the last session, the following will result:

1. With the chief warrant officers legislated into the commissioned line, we will, immediately upon the bill's passage, gain 388 permanent officers, and these should make 4 new permanent rear admirals, 19 new permanent captains, 50 new permanent commanders, and 107 new permanent lieutenant commanders.

2. If the 700 line duty officers and 500 aviation officers get permanent commissions further permanent promotions will result as follows: Rear admiral, 12; captains, 60; commanders, 156; lieutenant commanders, 324. These promotions would not come in a lump, but would probably be distributed over a considerable time dependent on the rate in which officers qualify for and obtain permanent commissions in the regular establishment.

3. Since there is no increase in the "permanent strength" of the navy, since the number of officers permanent and temporary in the grades of commander and above is based on the permanent strength, and since the upper grades are already filled by temporary promotions to the number allowed for that permanent strength, further temporary promotions to those grades will come only when vacancies occur by retirement or death.

4. Additional temporary promotions will come in the grade of lieutenant commander and below in proportion to the additional number of officers permanent and temporary we take in. Additional temporary officers may be appointed from the naval reserve force to fill the temporary vacancies created by the bill. If they are appointed it will give us in all 7259 officers, in the line of whom 3171 will be temporaries and these will serve only until June 30, 1920, unless by that time a new law is passed.

5. For retired officers of the grade of lieutenant commander and above who served but were not promoted during the war, provision is made for a promotion to the next higher grade upon recommendation therefor by a board of five flag officers appointed for that purpose.

While the legislation reported by the Senate Committee will not give us that permanency in officer personnel the situation demands, it will give us, provided the reserve officers will accept temporary commissions, sufficient officers to properly operate the navy until July 1 next year. It would be infinitely better to legislate for the future on a sound and permanent basis, but apparently there is no willingness to do so at this time. The Senate legislation would help the present situation only to the extent we could persuade temporary and reserve officers to accept permanent commissions and other reserve officers to accept temporary commissions. It is probable that not many temporary or reserve officers would continue on duty as temporaries if they are certain to be dropped July 1, 1920. They will rightly take the view that if they must finally go back to civil life the sooner they get there and stay there the better. On the other hand, if the 1921 appropriation bill should carry an increase in the authorized enlisted strength and provide also for the increase of officer personnel to meet it, those that stay in or come in will then be in a position to accept permanent commissions with great advantage to themselves.

In view of the assumed uncertainty of our future naval strength, legislation similar to that of the Senate bill is probably all we can get even though it does fail to meet the requirements. It will leave us in an uncertain condition at a time when it is most necessary to build for the future. Perhaps the worst thing about not getting adequate legislation now is that we will lose our opportunity to get qualified officers, for when the bill does pass—having become weary of the uncertainty,—practically all of the temporary and reserve officers will have left us and will not return even though the legislation takes a form that would permit them to do so.

Thus far I have dealt almost entirely with the number of officers the navy needs, the number we will have if certain proposed legislation is enacted, and the resulting promotion. Those are points that we are interested in because of their effect on us per-

sonally. There is, however, a side other than that which the government should give or is giving us, and that is *what we are giving the government and country.*

Taken as a whole there is probably no group of men who give so much for so little return as do naval officers. That is as it should be in a service for one's country. But with all our effort is our officer personnel doing all that *it* can do? It may be that most of us feel we are doing about all we can, but is *all* our energy rightly directed? Have we any energy left to exert in other directions?

The Officers' Division of the Bureau of Navigation had a difficult position during the war. While it did not itself select and assign officers to *high* command, its records were nevertheless consulted to ascertain the fitness of officers for such command. In assignments below the highest the matter was entirely in the hands of the officers of that division. It may be of interest to know that the division studied officers carefully, and its one object was to get the right officer in the right place. One of the things that came up most frequently was that we could find few or no records that were indicative of an officer's ability to handle the major problems of a great naval war. Our records showed that we have officers wonderfully skilled in individual ship work, but officers capable of taking command of a force more or less independent were continually wanted. What officers had prepared themselves for that work? We had a list of the graduates of the War College, and a list, a very short one, of those who had completed the War College correspondence course. Those lists were small, but they were the only *official records* at hand that showed what officers had been trained in the broader phases of naval warfare. Of course, there were other officers not on those lists who had prepared themselves, and some were known by reputation, but even with those the list of officers known to be fully trained for major operations was small. Reports of fitness told who were proficient in the grades then held by them, but the reports were utterly and totally silent as to who could or could not make an estimate of the situation based on sound principles, or who could or could not efficiently plan, order, and have an operation carried out. We were long on highly trained watch and division officers, and highly skilled engineer, gunnery, navigating, executive, and commanding officers, but when it came to

group or division commanders, squadron commanders, etc., it sometimes became a matter of guess as to who were fully prepared for such work.

It dawned on the Bureau at that time that naval officers as a class live too much in their immediate jobs and do not prepare themselves fully for the very important work that goes with the higher rank that sooner or later comes to them. We must always make good on the job at hand, and many officers have been content with doing that because the immediate task has been an important one and one that must be succeeded in. We cannot and must not overlook the importance of our immediate tasks, but in a profession such as ours doing just that *is not sufficient*. We must not only make good in every individual task assigned to us, but also *we must be ready to make good in much larger tasks when they come to us*. For that reason our officer personnel must study more and know more about the broad principles of naval strategy and tactics than we have in the past. A successful division officer will usually make a successful head of department, a successful head of department will make a good executive or captain, but merely being a good captain does not in itself prove that a man will make a good group commander or flag officer, because the duties are so dissimilar.

For training up to captain our system is excellent, though it can be much improved, but for preparing one for duties where he has more than his own unit to command our system is inadequate. How many officers of command or of lesser rank have we who have really studied the strategy and tactics of modern naval war and fitted themselves to command anything larger than a single unit? Not a great many certainly, and yet such knowledge is essential to every officer who is really competent and certainly essential to one who may be called on to operate the fleet or any subdivision of it.

Many officers seem to think that being in the navy, knowing navy life, and doing navy work, of itself causes a naval officer to function as a strategist and tactician. Nothing could be further from the truth. Strategy, tactics, war planning, and preparing for war require study—hard study and lots of it. If we officers do not study and fit ourselves for higher work, we fail in our duty, and we make the navy a failure too. We cannot even build up the material of our navy on efficient and modern lines unless we

know the navy needs, and we cannot know navy needs without knowing naval warfare from top to bottom.

In keeping with what I have just said another point has presented itself. Since the Selection Board has been in operation the Bureau has heard many complaints about our "reports of fitness." The Selection Board has a very hard task to perform because our reports of fitness seem to be "too good." Officers who have served on the board complain that the marks are too high and that while the average mark *should* be about 3.4 it is actually about 3.7. There may be much truth in their contention, and closer marking would be a tremendous help, but as a matter of fact our present fitness reports as drawn up can not give good information as to what officers are most suitable for promotion.

The man who should be selected for promotion is the man who will best perform the duties of the *next higher grade,* and not necessarily the man who can best perform duties in the lower grades. Therefore, what a selection board wants is information that will show who will do that best work in the higher grade. Our present reports cover only the duties an officer *has* performed, and because we have the most efficient officers in the world and because they do the work assigned them thoroughly, the marks on present duty must invariably run very high. Marks in one's present grade are necessary and are a great help since it is certain that a failure in a lower grade will not be a great success in a higher. But a successful man in a lower grade may not necessarily be a success in an upper grade. The time is coming, and coming soon if selection is to be successful, when officers must show their ability to handle the duties of a higher grade *before* they are selected. It is not a difficult thing to determine, and if we all go in for it, it can be made successful.

Our present reports of fitness amply cover an officer's ability on his immediate duty. We must now find a way for an officer to demonstrate his fitness for higher duties. This can be done by ascertaining his ability as strategist and tactician, his ability to estimate any situation that confronts him and to reach sound decisions as to what to do, his ability to issue short and clear orders to carry out his decisions, etc. The *first step* to train officers in these things is to *require* us to take either the regular or the correspondence course of the Naval War College. Every officer when he reaches the rank of lieutenant commander must begin

that work, and every officer of that rank or above it should immediately start one or the other course, if he has not already taken it. *And he should complete the course.*

Every officer who makes up his mind to do so can complete an installment of the War College correspondence course each quarter. Those who take the correspondence course should complete it in three and a half years or less; those who take the regular course will complete it in one year. In each case officers should be given marks *by the War College* on each problem or installment completed, and these marks should be tabulated to show an officer's ability along the various lines required of a high commander and these marks made a part of the officer's official record in the Bureau of Navigation. Officers who take the correspondence course should later and as soon as practicable also take the regular War College course. If we require from each officer only the above War College work not only will we have done much to improve our personnel, but more than that we will have at least something on which to form an estimate of an officer's fitness for higher command.

Our work of preparing ourselves should, however, go much farther than just the War College course. It must continue all the time if each officer is to progress and keep up with the developments of naval warfare. Furthermore, the navy can develop itself in all its functions only by its officers knowing all phases of its work and it will develop properly only to the extent that all its officers go in for the navy's and their own development and study the problems, large and small, and the needs of a navy that is constantly improving. Therefore, when a War College course has been completed further problems should be sent out to officers to solve, one for the each half-year covered by a fitness report and embracing new phases of naval warfare, and officers should be assigned marks on their ability to handle the various features of that problem. By having a record of those marks in the Bureau of Navigation we will have at hand an excellent means of determining an officer's naval value, but the greatest value of the system will lie in the fact that our officers will be made much better officers and will thereby make the navy as a whole very much better.

The only difficulties in such a plan lie, *first* in the way it is entered into by the service, and *second,* in supplying the large per-

sonnel to the War College to carry on its work. As to the first difficulty if we have our hearts in our work, and the country's as well as the navy's welfare in our hearts, there will be no opposition to this plan, but on the contrary an actual demand for it. The second difficulty will be serious, but it can and it must be overcome.

During the war with Germany the officers of the U. S. Navy did their work in a way that makes them deserving of all the reward and all the credit that has been or can be given them. Only those who were in close touch with the various forces ashore or afloat know of the tremendous work and the efficiency shown by the officers of the regular navy. That work upheld the best traditions of the service, and had our officers done no more than the duty they did in war operations they would be deserving of the very highest praise. But although that work was splendid and trying, officers doing it still found time to make, train, and develop, thousands of more of their own kind. Their achievements in this respect were even more remarkable than their operating achievements. Both were due to the remarkable spirit and tireless energy of officers who brook no defeat.

The spirit shown throughout the war by our officer personnel left nothing to be desired, and it was nowhere better shown than in their dealings with the Detail Office of the Bureau of Navigation. Personal desires and wishes were expressed, of course, but there was no other effort made by any officer to get an assignment to duty. When practicable the expressed desire of an officer was granted, but whether his request was granted or not the officer invariably took whatever duty he was assigned to without once questioning or objecting to the decision.

No one seemed to have any desire other than to do what he could to win the war in the place the Bureau thought he was needed, and no matter where he was sent he put personal affairs in the background and never complained, but went ahead to do his part fully and completely. It was this spirit that made the navy what it was in the war, and it is the same spirit that will guide us now and make us make our navy what it ought to be in the future, the best and most efficient navy in the world.

On the whole, better times seem to be coming to us in that we are probably to have a more nearly sufficient personnel. Promotion should remain good, and there will probably be enough officers to enable us to accomplish much more than we have been able to

in the past. In return for these improvements it behooves us as officers to leave no stone unturned to better ourselves and our service. We must never again lose sight of the importance of sufficient personnel, but no matter whether we get sufficient personnel or not we must make ourselves and keep ourselves efficient in *every* part of our work.

Our work in the past has been hard, and never harder than during the thirty months just completed. Those months have made our sufficiency and insufficiency, and our efficiency and inefficiency stand out. We must not again go back to what we were before the war, or be satisfied to be anything but to be the leader of the navies of the world. The quality and efficiency of our navy of the future will be the quality and efficiency of our officer personnel. The United States Navy will be what you and I make it. It will be just as much but no more than we make of it *and of ourselves.*

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THE VOLUNTEER NAVY IN THE CIVIL WAR

On account of the emergency created by the great rebellion of 1861, a large increase in the number of officers of the navy became absolutely necessary. The number of vessels in the navy, of all kinds, on March 4, 1861, was 76; the number purchased during that year was 136, and the number constructed 52, making the total number of vessels in the navy in December, 1861, 264, or 188 more than March 4, 1861; and the number of enlisted men was increased during the same period from 7600 to 22,000. This great increase of vessels and men required more officers than the navy at that period, weakened by the withdrawal of many officers of all grades to engage in the rebellion, could furnish; hence the Secretary of the Navy, early in 1861, determined to appoint acting officers, or, as they were called, to distinguish them from regulars, volunteer officers. There were several sources from which this required supply of officers could be obtained: 1st, the officers who had, during time of peace, resigned; 2d, acting midshipmen who had resigned, before graduation from the naval school; 3d, those persons who had formerly served in the navy as petty officers and enlisted men; 4th, pilots and men employed in the western rivers; and, 5th, and by far the most prolific, the commercial marine. Those appointed from the commercial marine, while being good seamen, were not proficient in gunnery, and, besides, they lacked the advantages of naval training; therefore, they were generally ordered first for ordnance instruction and the requisite and proper training. Notwithstanding the stringent regulations for discipline peculiar to the navy, the military bearing and address required, and the disadvantages before referred to, the good services and record of these officers are attested, not only by the large number of promotions after examination, but by many promotions for gallantry in battle and for faith-

ful service, and by the fact that after the close of the rebellion 4500 were honorably discharged with the thanks of the department, and many were admitted, after examination, to the regular navy and to the marine corps. During the year 1861 there were appointed 23 acting lieutenants, 29 acting volunteer lieutenants, 562 acting masters, about 300 masters' mates, 88 acting assistant surgeons, 93 acting assistant paymasters, 240 engineers, and 340 officers of all grades in the Mississippi squadron (those in the Mississippi squadron were mostly appointed early in the year 1862), a total of about 1700. The acting lieutenants were officers who had formerly served in the navy; the acting volunteer lieutenants had not previously served in the navy—at least, not as commissioned officers. Masters' mates having been in many cases appointed by commanding officers of navy yards, squadrons and vessels, under general authority from the Secretary of the Navy, considerable trouble is experienced in arriving at the precise number in that grade, but 300 is doubtless a fair approximation.

Between March 4, 1861, and July 24 of that year, all acting appointments were made as a "military necessity," without direct authorization of law, but the act of July 24 provided that the "temporary appointments made, or which may be made, by the Secretary of the Navy of acting lieutenants, acting paymasters, acting assistant surgeons, acting masters and masters' mates are ratified and confirmed as temporary acting appointments until the return of the vessels in which they are respectively employed, or until the suppression of the present insurrection, as may be deemed necessary." In July, 1862, the Secretary of the Navy began appointing acting ensigns, and the act of March 3, 1863, legalized the appointments.

As the rank of all the acting officers (except masters' mates) corresponded with that of regular officers of like grade, their pay was made the same. By the act of May 17, 1864, the appointments of acting commanders and acting lieut. commanders were authorized, and by the act of March 3, 1865, the appointments of acting passed assistant surgeons; and the same act directed that masters' mates (or acting masters' mates) should be styled mates, and also provided that mates could be rated from seamen and ordinary seamen, such rating not to discharge them from their enlistment. The rating of enlisted men as mates had, however, been previ-

ously authorized by the Secretary of the Navy under the department circular of October 7, 1863.

It is entirely impracticable to give anything like a fair and correct history of the individual services of these officers of the volunteer navy; indeed, such history would necessarily be incomplete, and there would, doubtless, be "invidious distinctions." Many acts of personal prowess were not specially reported, and, in the hurry and confusion incident to the times, the gallantry and meritorious services of not a few were unintentionally overlooked, or not properly recognized and rewarded. In the second year of the war (July 16, 1862), it was enacted that any person who shall have received, or shall hereafter receive, a temporary appointment as acting volunteer lieutenant, or acting master in the navy from civil life, may be confirmed in said appointment in the navy, and placed in line of promotion from the date of said confirmation if, upon the recommendation of the President, he receives the thanks of Congress for highly meritorious conduct in conflict with the enemy. Although no promotions were specially made under this act, there were many made for gallant and meritorious conduct, and at the close of the war a board was organized (act of July 25, 1866) for the examination of candidates from the volunteer for admission to the regular naval service. Any line officer who had served two or more years in the volunteer service was allowed to appear before the board. The number of candidates summoned to appear before the board was 426, the number appearing was 305, and the number found physically, mentally and professionally qualified was 64.

It should not be presumed that those admitted into the regular service were the only ones qualified therefor. A large majority entered the volunteer navy for the single and heroic purpose of giving their services, and, if need be, their lives, for the preservation of the Union. That object attained, and the authority of the government re-established on land and sea, resignations in large numbers immediately followed, the volunteer deeming his work and duty done, and the object for which he entered accomplished.

On May 1, 1865, the rebellion being then practically ended, the work of reducing the volunteer navy was commenced. The Secretary of the Navy ordered that, in mustering out volunteer officers, all in the service on that date should be allowed one month's leave of absence for each year of service. On the 1st of January, 1865.

there were 5278 volunteer officers of all grades in the navy, while on the 1st of January, 1869, there were but 170, and on the 1st of January of the year following only 111.

It was not, however, until July 15, 1870, that all acts or parts of acts authorizing the appointment of temporary acting officers of the navy, except as to assistant surgeons, were repealed. The authority of the Secretary of the Navy to retain any volunteer officers after the close of the rebellion was given by the act of July 25, 1866, and the exercise of that authority was by the act made conditional upon its being required by the exigencies of the service.

Of the 64 officers mentioned above, the ex-volunteer line officers living at this date are Rear Admirals Ch. O'Neil and O. W. Farenholt, Captains G. R. Durand, J. K. Winn, W. H. Webb and C. A. Schetky; it is believed the latter is the oldest living officer in our service.

(The above information is from a clipping and data furnished by Admiral Farenholt.)

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SHIP *BETHEL*

By T. G. FROTHINGHAM

To show the enterprising spirit of the American Colonial Merchant Marine, the cradle of the U. S. Navy, the following is of interest:

The Boston *Evening Post* "printed August 29, 1748, by T. Fleet, at the Heart and Crown in Cornhill," contains the following letter, which is also given in full in the Memoirs of Josiah Quincy, Jr. ("of 1775") and of His Ancestors, by Eliza Susan Quincy (Boston, 1870).[1]

[1] MSS. in possession of Mass. Historical Society.

ST. JOHNS, NEWFOUNDLAND,
August 1st, 1748.

To Messrs. Quincy and Jackson.

Gentlemen:

My last was from Leghorn 9th of April, to which refer. We sailed thence 10th do. 16th took the *St. Joseph* a Polucca Punk from Salonicka for Marseilles, Jo Chaupe deBarr, Master, loaded with tobacco, which carried with us to Cagliere, and after performing Quarantine sold her for 5000 Dollars. We had her condemned in Port Mahon (where left the money with Messrs. Ferrand Miller & Co., to be remitted Slingsby Bethel Esq'r,—all which I suppose Mr. Bethell has informed you of e'er now. The 10th June we left Gibraltar, the 19th in Latitude 36° N. off Isle St. Mary's met with and took the *Jesus Maria and Joseph*, a Spanish Register Ship, Don Antonio De Borges commander, from the Havana for Cadiz, with 110 men, and 26 guns. The cargo we are at a loss to know the value of, as the papers were all hove over board, but by best account when she left Havana was valued at 300.000 Dollars. have found on board in specie 171.000 Doll's. Her other cargo is Cochineal, Hides, Snuff etc. We having such a vast number of prisoners to secure and both ships to man and only 37 men and boys on board were obliged to put in to Fayal, where we have been most barbarously treated, as imprisoning myself and people, attempting to force our prize from us etc.—in short must leave particulars till I have the pleasure of seeing you, which God grant may not be long. We left Fayall 2d July, and being short manned as you may judge, and credibly informed of divers Spanish cruizers on our coast, could not think it prudent

to risk two such valuable ships on the coast without Insurance, as the Insurance of the *Bethel* is broke by this deviation, and determined to proceed to the first port, which was this, where we arrived 28th July. Have applied to the Judge of Admiralty to condemn the ship, for judging it best for divers reasons to have her condemned as soon as possible. It seems there is some difficulty about condemning said ship in the Plantation as she is a Register ship, which I doubt not will soon get over—cannot yet positively say when. shall advise you per Capt. Huske, how I shall proceed. If it is not possible to condemn the ship and she must go to England it will be hardly worth while to bring her to Boston. Should she be condemned, the *Bethel* and she in company sufficiently manned I apprehend there will be but little risk between here and Boston, for which reason have lightened the *Bethel*, who is exceeding deep with salt etc. per Capt. Collins, by whom these comes, and who is to have 402£ old Tenor for freight, I advise with Mr. Bethuen about proceedings.

Your family I hope are well and must desire your care and assistance by all necessaries to mine which this long absence almost makes me despair of seeing

I am Gentlemen with due respect
your most obed't humble serv't

ISAAC FREEMAN.

P. S. Particulars of taking the prize follow. About 6 P. M. we made a sail, to which gave chase, as we were standing partly towards each other soon found her to be a large ship, and she took in her small sails hauled up courses as getting in posture to engage us, but we not regarding that she soon made all the sail she could pack in order to run. We having the heels of her overhauled her apace and the night though very dark was not able to conceal her from our sight. finding we had the heels of her as before observed, assured us if she should prove too stout we could but make a retreat. At 12 at night was alongside, when after a serenade of French horns and trumpets etc. demanded from whence she came and whither bound. When after a few equivocations allowable in such cases, as pretending to be from Surinam for Holland etc. She announced she was from Havana for Cadiz, at which we gave them a hearty cheer, and ordered her boat and Captain on board immediately. He begged we would tarry till morning as his boat was large and leaky, but we threatening him with a broad side which he much feared he complyed.

By daylight we had the last of the prisoners secured, who were ready to hang themselves on sight of our six wooden guns, and scarce men enough to hoist top sails. You may easily imagine we had enough on our hands till they were landed at Fayal. I believe its the first instance of such a prize being taken by so small a force without firing a single on either side, but however I assure you I esteem it much better than fighting.

Since writing the above have seen the Judge who says he sees no difficulty in condemning the prize here, nor expects to meet any, but as there are many papers to translate it takes some time. I shall write Mr. Bethel next week as I have done from Fayal. Notwithstanding the valuation above have some reason to think she may be worth twice the money, but not having broke bulk can't say.

The following is the comment of the *Post* on the capture:

This is, perhaps, the only Instance since the War began, of so stout a Ship's being taken by so small a Force, without firing a Gun; and the Spanish Don may truly be said to have been jockey'd out of a Prize worth the best part of an hundred thousand Pounds Sterling, by the Courage and Art of an honest New-England Man.

The Art of fighting, each Commander's Care,
Lies not in Strength, but Stratagems of War.

Additional details of this surprising adventure are given in the mss. Quincy Memoirs:

In 1748 he [Josiah Quincy] went to Europe a third time, first to Ireland, and from thence to England and France. While he was in France a remarkable event happened. His brother Edmund Quincy, Edward Jackson, his brother-in-law, and himself, were mutually concerned in a ship named "the *Bethel*," which they sent this year on a voyage to Europe. At that period there was a war with Spain, and danger was apprehended from the Spaniards, who were in the habit of attacking English vessels, and treating their crews with the greatest barbarity. This merchant-ship therefore, was fitted out with fourteen guns, which it was thought might overawe their enemies, and keep them at a distance, and one of the owners also obtained a letter of marque for the commander, Captain Freeman.

Accidentally falling in with a Spanish ship in the night time, the Captain thought it prudent, to make as formidable an appearance as possible, in self-defence. He therefore mustered all his men (about thirty eight) upon deck, increased their apparent number by putting all the hats and cloaks, which could be found on sticks, and then hoisted lanterns in all parts of his ship.

To the astonishment of all on board, the Spaniards deceived by these appearances imagined themselves on the point of being attacked by an armed vessel of great force, and surrendered without the slightest resistance, not even firing a single gun.

The ship proved to be the *Jesus* Register Ship, bound from Havanna to Cadiz, loaded with gold and silver to a great amount, carrying twenty-four guns, and one hundred and ten men. Surprised at the success of their own manoeuvres, they secured this valuable prize, although the rage and vexation of the Spaniards knew no bounds, when they found they had surrendered, to such an inferior force. This discovery however came too late, and they were forced to pay the penalty of their cowardice, by the loss of their ship, and her precious cargo. It was carried into Fayal, and from thence to Boston, where it was condemned as a lawful prize, according to the laws established among nations respecting property in such circumstances. In this instance, as the treasure taken, belonged to the king of Spain, the owners had the good fortune to realize a handsome property, without injuring any private individual.

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"U. S. C. N."

By LIEUT. COMMANDER K. C. MCINTOSH, S. C., U. S. N.

That's a hundred and fifty thousand dollars in his vest pocket if he knows how to use it . . . . No, I didn't tell him the money value—he'd send his valet to find out.—THE CAPTIVE, Kipling.

I

Away back in the days of grand political rallies, of torchlight processions and campaign songs and slogans, the days when men went about decorated with gold or silver beetles and the air was filled with shouts of "Remember the crime of seventy-three!" and answering yells of "American tin!" the question of ships began to stir and trouble a few—very few—far-sighted men.

A little later it took form as a slogan of its own, and the excited gentleman on the cracker-barrel would wave his arms and declare that the issues before the American people were imperialism and ship subsidy! When for the *last* time the American people declared through their representatives that they would not have ship subsidy other than for transporting the mails, that phase of the question subsided, but the question itself would not down. Laws and parts of laws were repealed, laws and parts of laws were passed, and still each year saw us less and less a maritime nation, more and more dependent on foreign bottoms to move our freight.

For a time it did not seem to make much difference, except as a matter of pride to the old ex-patriates of the Asiatic and the Mediterranean, who looked sadly at the display of British, German, Norwegian and French colors yonder in the bay and remembered when that bay had been full of Yankee clipper-ships. Then, little by little it began to become everybody's question and everybody's worry—*America must have ships!*

Some years ago, as editor of Guam's monthly newspaper, in a desperate effort to fill up eight pages we wrote an article entitled "Guam in the Future." It was an anarchistic and outspoken

article; and when some weeks later we learned that no less a person than the Secretary of the Navy had taken cognizance thereof sufficiently to demand verification of its statements from the governor, we shook in our white canvas shoes. But the Secretary did more than verify—he disseminated information. To our infinite amazement we began to receive letters from members of Congress, from the Land Office, from the Chambers of Commerce of San Francisco, Honolulu and Manila, and from the governor of Samoa. It was a case of make good or back down, and we attacked the problem of Guam's commercial and financial situation with an energy born of fright. Immediately our head ran hard against the stone wall of *there are no ships*. We continued to write and struggle, with the very hearty backing of the governor; and, after scoring several flat failures, finally summed up the problem as follows: "Without ships, Guam cannot market her surplus products, and will not raise anything to balance her imports. Until Guam raises a surplus for shipment, no ships can be induced to stop here. To make the planters work hard enough to attract regular shipping, some one must furnish *a* ship at a temporary loss." Apparently the Navy Department reached the same conclusion, and the old *Supply Maru* began carrying copra to Manila. There are now regular schooner lines plying from Guam both eastward and westward. The island is started toward economic independence.

In 1916, a Pan-American trade congress was held in Buenos Aires. The United States High Commission was prepared to discuss banking and exchange problems, monetary standards and credit systems. With one accord the South American delegates cried for ships! ships! More ships! Without them any system is useless; with them credit can quickly arrange itself. At that time, Brazilian planters were begging small schooners to take away their coffee at $22 a ton and over; and the price of coal on the Rio waterfront included a freight rate of 110 shillings a ton.

In 1917, the submarine stated the question all over again in stentorian terms, ending with a thunderous exclamation point, and the world suddenly cried out in agony, "Send us ships or we die!" We stopped searching for the best, the quickest and the easiest way. We had no more time for study. We had to build ships, and we built them, and we now have them in large numbers. So to-day we have, on one hand, the same old problems of trade development for which ships are the only answer; on the other,

a large number of ships engaged in an abnormal trade which, if continued after the emergency has passed, will place us in a position antagonistic to our present Allies and our own shipowners.

The ships now at our disposal are grouped into five classes:

(1) American-owned ships taken over for the war.

(2) Foreign ships chartered.

(3) Foreign ships requisitioned.

(4) Captured enemy ships.

(5) Ships built since the outbreak of the war by the Emergency Fleet Corporation.

Classes 1, 2 and 3 are ours but temporarily and must go back to their owners in a very short time. There remain indefinitely on the government's hands classes 4 and 5, numerically in excess of the first three classes. Each ship of classes 4 and 5 represents a large investment of money obtained by the sale of Liberty Bonds, for which the taxpayer will be furnishing interest for some years to come. If we sell or lease the ships to privately owned lines we must do so at a price far below their actual value; for besides the depreciating effect of the sudden offering for charter or sale such a large tonnage, our laws do not permit American ships to compete with foreign ones for oversea business unless they can in some way materially reduce their initial cost. In other countries initial and maintenance costs are both government-aided by subsidy. We have definitely declared against any form of subsidy other than for carrying the mails. Consequently, a private company buying our ships must beat us down to a figure which will enable them to operate. We will not get the full price to redeem the spent Liberty Bonds, and would have nothing but our annual interest charges to remind us that we were once shipowners. To meet this interest we must tax a man enough to pay him back with his own money. Similarly, with the return of normal peace conditions and normal competition, any rental which we could exact for private charter would barely return us our interest and leave the bulk of the people saddled with the responsibility of producing the money necessary to repay their maturing bond investment. With all our distrust of the new and untried in governmental procedure, we are faced with the necessity of either costing ourselves and the country much money or of running those ships to profit ourselves. Until the last $50 bond which entered into the refitting and construction of those ships is repaid, they cannot be written into the national plant

account. They represent an unfulfilled debt, and we have no right to dispose of them at a loss unless we first declare ourselves nationally bankrupt before our own people and persuade them to accept a settlement at something under cent per cent.

The problem of Guam is the problem of the Southern Philippines. Many times multiplied, it is the problem of South America, of the China Coast, of the entire world below the Tropic of Cancer. When the government put a ship on the Guam run, the trade developed and an entire nation, small though it be, was set upon the path of independence. If we do not run our ships, we will as a nation lose both money and trade. If we do not run our ships, we must look forward to undeveloped islands, unexploited markets, alienated friends. Both sides of the quandary are forcing us forward along the resultant line. We must run our ships ourselves.

Immediately arises the first objection in the form of the rights of private-owned steamship companies operating under American register. These companies were plying their trade and making a living before the war. At considerable inconvenience and danger to their carefully established goodwill, they patriotically stood silent while we took their ships from them and ran them for the prosecution of the war. Now that we return them their ships, shall we take away their trade by competing with them? The Socialists might answer "Yes!" but as yet they represent but a small minority of our people. At the present time such a course would raise a storm of protest from every line of business, from the farm to the factory. Let us avoid this objection then by resolving in the beginning to leave these gentlemen alone in their fields—in the wide world there is room for them and for us, and for our Allies as well. With every cockboat in the world working, there will for a generation be a shortage of ships, and probably there will never be as many as the world could use at any one time.

A glance of Chart I will shed immediate light on the problem. American steamship companies have by no means girdled the world as yet—have not even attempted to cover the available first-class trade, and have hardly touched the tramp trade at all. Surely, from these few lanes we may sheer wide and still employ all our tonnage. We may even leave the transpacific field from which the Pacific Mail retired after the passage of the Seamen's Act in the expectation that the run will be reestablished after the

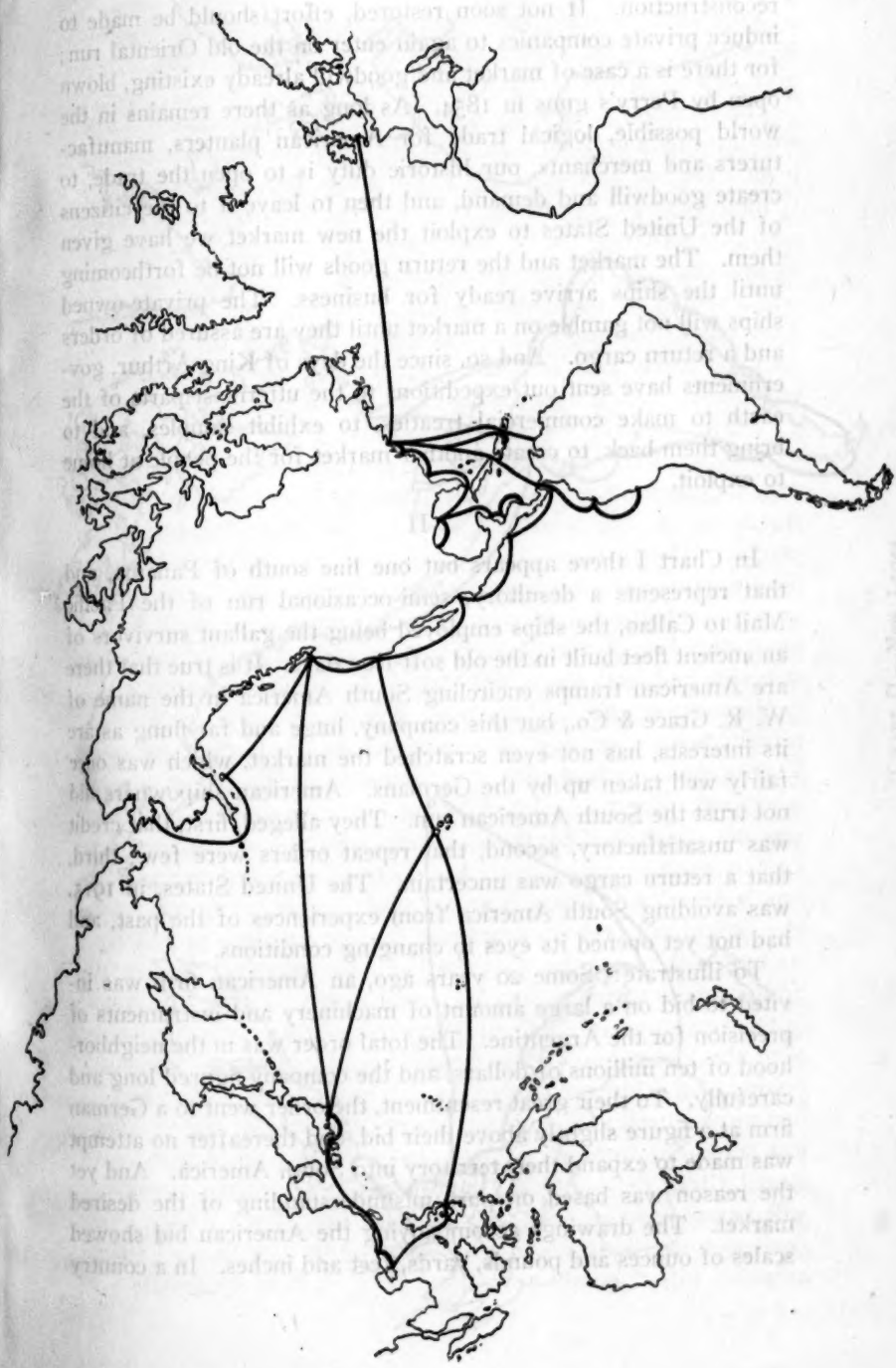

CHART I.—Principal American Steamer Lanes In Use Before the War.

reconstruction. If not soon restored, effort should be made to induce private companies to again enter on the old Oriental run; for there is a case of market and goodwill already existing, blown open by Perry's guns in 1854. As long as there remains in the world possible, logical trade for American planters, manufacturers and merchants, our historic duty is to open the trade, to create goodwill and demand, and then to leave it to the citizens of the United States to exploit the new market we have given them. The market and the return goods will not be forthcoming until the ships arrive ready for business. The private-owned ships will not gamble on a market until they are assured of orders and a return cargo. And so, since the days of King Arthur, governments have sent out expeditions to the uttermost parts of the earth to make commercial treaties, to exhibit samples, and to bring them back, to create another market for the people at home to exploit.

II

In Chart I there appears but one line south of Panama, and that represents a desultory, semi-occasional run of the Pacific Mail to Callao, the ships employed being the gallant survivors of an ancient fleet built in the old soft-iron days. It is true that there are American tramps encircling South America in the name of W. R. Grace & Co., but this company, huge and far-flung as are its interests, has not even scratched the market, which was once fairly well taken up by the Germans. American shipowners did not trust the South American run. They alleged, first, that credit was unsatisfactory, second, that repeat orders were few; third, that a return cargo was uncertain. The United States, in 1915, was avoiding South America from experiences of the past, and had not yet opened its eyes to changing conditions.

To illustrate: Some 20 years ago, an American firm was invited to bid on a large amount of machinery and instruments of precision for the Argentine. The total order was in the neighborhood of ten millions of dollars, and the company figured long and carefully. To their great resentment, the order went to a German firm at a figure slightly above their bid, and thereafter no attempt was made to expand their territory into South America. And yet the reason was based on pure misunderstanding of the desired market. The drawings accompanying the American bid showed scales of ounces and pounds, yards, feet and inches. In a country

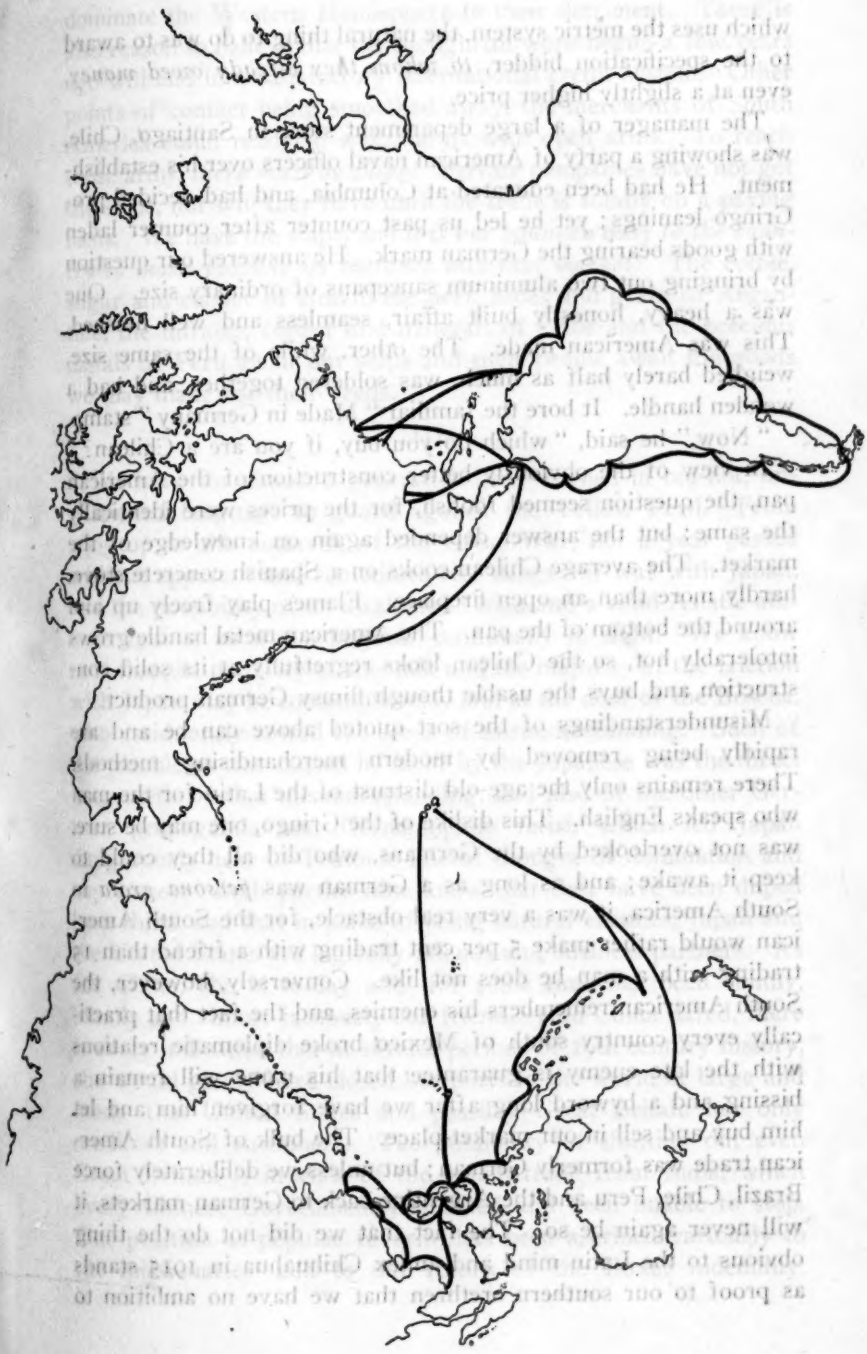

CHART II.—New Lanes.

which uses the metric system, the natural thing to do was to award to the specification bidder, *to whom they already owed money*, even at a slightly higher price.

The manager of a large department store in Santiago, Chile, was showing a party of American naval officers over his establishment. He had been educated at Columbia, and had decided pro-Gringo leanings; yet he led us past counter after counter laden with goods bearing the German mark. He answered our question by bringing out two aluminum saucepans of ordinary size. One was a heavy, honestly built affair, seamless and well finished. This was American made. The other, while of the same size, weighed barely half as much, was soldered together, and had a wooden handle. It bore the familiar "Made in Germany" stamp.

"Now," he said, "which do you buy, if you are a Chilean?"

In view of the obviously better construction of the American pan, the question seemed foolish, for the prices were identically the same; but the answer depended again on knowledge of the market. The average Chilean cooks on a Spanish concrete stove, hardly more than an open fireplace. Flames play freely up and around the bottom of the pan. The American metal handle grows intolerably hot, so the Chilean looks regretfully at its solid construction and buys the usable though flimsy German product.

Misunderstandings of the sort quoted above can be and are rapidly being removed by modern merchandising methods. There remains only the age-old distrust of the Latin for the man who speaks English. This dislike of the Gringo, one may be sure, was not overlooked by the Germans, who did all they could to keep it awake; and as long as a German was *persona grata* in South America, it was a very real obstacle, for the South American would rather make 5 per cent trading with a friend than 15 trading with a man he does not like. Conversely, however, the South American remembers his enemies, and the fact that practically every country south of Mexico broke diplomatic relations with the late enemy is guarantee that his name will remain a hissing and a byword long after we have forgiven him and let him buy and sell in our market-place. The bulk of South American trade was formerly German; but unless we deliberately force Brazil, Chile, Peru and the Argentine back to German markets, it will never again be so. The fact that we did not do the thing obvious to the Latin mind and annex Chihuahua in 1915 stands as proof to our southern brethren that we have no ambition to

dominate the Western Hemisphere to their detriment. There is also reason to believe that the thoughtful work begun a few years ago will end in a satisfactory international credit system. Other points of contact being smoothed away, the merchants of South America stand ready to welcome us with open arms. To reach those arms, *there must be ships!* Private companies have not got the ships, nor will they have until the trade is solidly on a paying basis. We have the ships, and *it is our bounden duty to the country to make possible its entrance into that market!* The coffee, sugar and rubber of Brazil, the beef, hides and grain of Argentine, the nitrates, copper and minerals of Chile and the precious metals of Peru await our ships and their people await the goods we may make for their needs.

III

We have for almost a generation been warned in red-hot, impassioned language to guard against the Yellow Peril. From 1905 up to the outbreak of the Great War, not a year passed without apparent and sometimes real danger of war with Japan, and the possibility of an awakened China and a solid Asiatic alliance against us was a bugbear continually in sight. We know now that the majority of this talk and the majority of the friction with Japan may be contemptuously laid at the door of the Bosche, who assiduously sowed the seeds of misunderstanding. Such of the trouble as was caused by us or by the Japanese was the direct outgrowth of that misunderstanding, and also of the other German propaganda and Germanophile fetish which led Japan dangerously near to Teutonic line of thought of domination and supremacy. Both parties now know that they have been duped by a third, and that in place of being natural enemies, Japan and the United States are logically friends and business partners. As for China, she is to-day and for some time has been solidly, blindly and almost fatuously our friend. Had China dared, there is every indication that at several periods of 19th century history, she would gladly have closed her ports to the world at large and made the United States and possibly Great Britain her only creditors and customers. The possibility of shutting out even Great Britain is in view of the opium trade from India, which every Chinese Government has hated and been unable to stop. Our position as popular favorite has been ascribed variously to the missionaries and to our return of the Boxer indemnity.

Neither reason is a true one—when the missionaries are not inflaming the resentment of the inland and medieval Tao Tsai or the fanatical secret brotherhoods of Mongolia, they are furnishing exactly the same metaphysical interest for the philosophical and hairsplitting Chinaman as the missionaries of other nations. Even where longest established and most firmly settled, the missionaries in China have made no preponderating impression on the vast Chinese people. Even in Macao, Jesuit since the 15th century, Chinese Mahommedans predominate, with Taoists a close second. And in North China, Marco Polo found a large percentage of Nestorian Christians, whose descendants in doctrine, like the adherents of Thibetan Lamaism, consider themselves Christians already and considerably nearer to the root of the matter than the missionaries themselves. As for the Boxer indemnity, not one Chinaman in a hundred thousand ever heard of it. No, our popularity in China has been built solely on our trade with China. Alone among the nations, we never "lost our face" in the days of clipper-ships. This is not hard to understand when we consider the men who manned the old American stick-and-string merchant marine—hard-featured, teak-faced Down-easters, keen business men, worthy opponents in "sharp practice," but absolutely men of their word when once definitely pinned to a bargain. No one more calculated to delight the heart of a Chinaman can be imagined. Moreover, in later days, when our flag was seen in the Orient only on a few large liners touching the greater ports, our fair fame was kept bright by the commercial missionaries of the Standard Oil Company, whose tiny lamps and five-gallon oil-tins have become a necessary feature of the economy of the most remote river village and so powerful a factor for prosperity, contentment and education that the Chinese Government is as grateful as any government is capable of becoming. The oil business of China is ours, and is being taken care of by private enterprise. Clearly, we have no shadow of reason for entering that particular field; but is oil the only American product which China would use if she could and which America would ship if guaranteed a market educated and waiting? We may even avoid competition with Japan and leave her the textiles trade which she has captured since the war with Russia. The most superficial inquiry should unearth some unfilled need, not of the China coast, merely, but of every one of her

hundred millions of people. To begin the fulfilment of that need is legitimate government business, and thereafter the American merchant and manufacturer will have another dependable source of revenue and China another reason for her friendship with us. The Yellow Peril will be pushed just that much farther back into the limbo of exploded bugaboos.

Moreover, since the German-made mumbo-jumbo of regional "hegemony" has been laid to rest without tears, there is no more reason for commercial antipathy between the United States and Japan than there is for a war between John Wanamaker and Andrew Carnegie. Four hundred million Chinamen eat and wear and play with more than both of these countries can ever sell them. Besides, we are fairly good customers for each other and can be better ones if we like.

IV

The ever-reliable and dependable *World Almanac* not being at hand, I am unable to state the population of the Southern Philippines. However, there are several hundreds of thousands and possibly several millions of people there in a state of civilization which grades from something better than the absolute primitive to something considerably less. The Moro, after substituting Islam for Rome, may be taken as a fairly good picture of one of our Crusading Ancestors, with his love for arms, high standards of personal honor and easily touched pride. He represents the upper level of the population, the lower approximating the Hottentot who can carry on a free and untrammeled conversation with a dog-faced baboon. We are attempting to civilize them with schools and churches. We may succeed in pacifying them entirely by those methods, but unless we return to the Jesuit tyranny of three hundred years ago, we will never make them producing members of the community by either religion or education. We must show them something desirable which they can gain only by working better and harder than is necessary to live as did their grandfathers, we must create a need. Once felt, that need will do more than any teaching to induce husbandry, trade and thrift. The old, disreputable Blackbirders realized this, and steered clear when possible of ports where missionaries were to be found. They were implanting the needs easiest to create—gin and guns—and wished no interference. At that, they did not col-

lect in their busiest days one per cent of the possible exportable goods of the islands, and they caused no greater expenditure of labor than is necessary to pick up dry cocoanuts and sea-snails. The industry of the Southern Islands and of the South Seas in general is gauged by the price of hardtack, canned salmon and blue denim. Here is a fertile field for endeavor, and again we crash against the same old obstacle—without ships, there will be no cargo, without cargo, there will be no ships. Again, it is the historic duty of the government to enter the first wedge and drive it home. Those islands will one day be developed to enormous and valuable trade by someone. It is logically ours, even if we abandon the Philippines at some future date, for Americans are the only whites in the world for whom the Moros and the lesser nations of the Southern Archipelago have ever felt the slightest respect. They have liked us and considered us capable and worthy opponents even while splitting our heads with a bolo, for unlike the Tagalog, the Southern Islander bears no malice and admires a good sportsman.

One item which the trend of matters in the civilized world will soon demand insistently from the South Seas is copra. The war has taught the world the absolute necessity of fats and oils, and while the steady decrease of the world's animal herds has in the past been a subject for uneasy headshaking, it is now becoming a question of dire and immediate urgency. Cottonseed, peanut oil, olive oil—these and more are being feverishly developed to replace the rapidly diminishing supply of edible animal fats; but greater than any of these and as yet almost untouched is cocoanut oil and its by-products. Nine-tenths of the world's copra is the result of some tattered or even naked islander's wanting a bottle of beer or a can of salmon. In a few places, copra is being systematically grown and dried, notably in Samar; but even in Samar, the output is limited by the transportation and the fact that no particular reason has been offered to spur the native to regular effort, and Samar copra is not of the best quality at that. Copra has been long a neglected asset of the world, and until the establishment of the India Produce Company of Philadelphia, practically the only markets for high grade copra were Hamburg and Marseilles. Even there, its use was largely confined to toilet articles and its food-value overlooked. And even with this limited and fickle market, medium-grade copra was worth $12 per

cwt. on the docks of Marseilles as long ago as 1911. With a very little effort on our part, the South Sea output of copra could be multiplied by five hundred, with a consequent gain to the world's supply of fats; and every pound of it could be carried in American bottoms and should be. And every cent of its purchase price at the beach could and should be spent on American goods brought in American ships. The desires of the islanders now range from beads and red calico to gilt mirrors and musical clocks. We have the ships to develop this trade, and if we do not use them, we will be omitting one of the historic duties of a navy to the nation that supports it.

Another item which we can and must cultivate in these islands is kapok, or tree cotton. In 1912, samples of Guam kapok sent to the Cotton Exchange of New Orleans for information as to its commercial possibilities elicited the reply that it would not spin or gin and was valueless. In 1913, not 18 months later, the burning of a single warehouse full of kapok in Manila caused a rise in price of *one hundred and fifty dollars per ton!* Kapok had found its use, and the world was clamoring. It constitutes practically an American monopoly at present, and while the navy alone can come near to using the world's entire output, that output measures only desultory gathering from age-old trees. Nowhere has kapok been established as a main line, nor has it been planted and cultivated, yet from the jungles of Guam alone, some twenty tons could be gathered annually. Guam is thirty miles by nine in its greatest dimensions, and its kapok trees are far enough apart to be noteworthy when found. When we bring goods of home manufacture to the islands sufficiently desirable to make the effort worth while, there is practically no limit to the kapok we can take away.

Trepang or "*beche-de-mer*" has a ready sale in China, and tons more than have ever been cured, cumber the beaches and embarrass the swimmer in every South Sea Island. Millions of feet of hardwoods wait the enterprise of the judicious forester, shiploads of dyewoods and spices are there to be taken away. Coals and metals lie waiting to be mined in these Southern Islands. The trade of the world needs them all; but the ships of the world must see them waiting on the dock before they will call. We must not only put them on the dock, but build the dock as well.

V

Some philosopher once made the discovery that the darkest place in the room is exactly under the candlestick. To look at the chart it would appear that the Caribbean and the Gulf were fairly well covered by existing steamship lines. It is then, rather a shock to the inquisitive American, when he inspects the wares of the average shop in the average West Indian town. I do not mean Havana or San Juan, for these cities have long had a definite trade link with the United States, and the ships and merchandise have appeared to handle and balance it. But we have also for many years had direct and frequent communication with Santo Domingo by way of the Clyde Line; yet in the normal Dominican shop we find Danish butter and herring, German lamps, clocks and trinkets, French canned goods, and a multiplicity of Spanish wares. Such American goods as are shown are of a grade not saleable in the United States, with the exception of bottled beers and refrigerators to keep them in. Half of this American export list will soon stop, and its absence may stop the other half. This poor showing in the shops of so near a neighbor has solid reasons, heretofore potent, but now removable by taking thought. First of all, since the days of President Grant in Washington and President Baez in Santo Domingo, the fear of annexation has led the Dominican to open hatred of "*los Yanquies.*" Since our war with Spain, this dread has at times become hysterical. As the Bishop of Santo Domingo expressed the popular feeling, "Puerto Rico—Guantanamo—Panama—Nicaragua—Haiti—St. Thomas—and now you are sitting in *our* forts!" "Better the head of a rat than the tail of a lion," cries the Dominican. But since our military occupation this feeling is changing. Admiral Knapp has been a revelation to Santo Domingo, and they begin to believe that our purpose is much more to preserve the integrity of their republic than to destroy it; that annexation by the United States is possible only as a last resort to prevent their annexation in part or in whole by a European power. They also are undergoing an era of solidity and progress which passes their wildest dreams—even outruns the plans of the late and unlamented Leli Heurreaux, who compensated his lack of justice and morality by a real patriotism and breadth of vision. The anti-Yanqui feeling is being rapidly conquered, and even at the beginning of the

occupation, many prominent Dominicans were being bitterly lampooned in the patriot press as *"ayanquizados."*

Communication is now existing here, and the only need is for a bit of careful merchandising to multiply our Dominican trade many times. The other end of the island, Haiti, is virgin territory; and legitimate ground for our endeavor. Already the majority of invested industrial capital is ours. We are to build Haiti's roads, railways and docks. Should not Haiti's payment of chocolate, dyewoods and coffee come to us in our own ships? Lasting good will has already been gained and the sound of *"Caco fini!"* brings a grin of pure delight to every black face in the agricultural part of the country.

The east coast of Central America is worked after a fashion by the United Fruit Company, the Central American Trading Company, and Hubbard-Zemurray. American goods, more or less adapted to the market, are floated down the coast, but what these gentlemen chiefly want for the return trip is a cargo of bananas. They will take other freight gladly if presented for shipment and if there is room in their holds. There has never been any violent effort made, however, to induce much production aside from fruit, and while the banana trade has no doubt been lucrative, the fact that the republics between Mexico and Panama live mainly by the desultory peon labor of the fruit plantation has made possible the never-ending series of revolutions and gunboating jobs that have been ours. Why not spend some of the time we use in preserving law and order by doing a little trade missionary work which will inevitably lead to more settled conditions? A busy man dodges a fight, and an idle one is apt to pick one.

The marines in Managua have, as usual, produced the opposite from the effect which was expected by the Latin-American world. Instead of continuing a sore spot and an offence against Nicaraguan sovereignty, they have convinced all hands that we do not wish to either conquer or annex Nicaragua. Let it also be remembered that all of these countries joined us in breaking relations with the Hohenzollern government. Most of them had no particular reason for doing so; but their action is a measure of their wild enthusiasm at what they consider a guarantee of their future. There were many of them who believed us a bully of small nations and a coward toward big ones. When we openly

tackled the biggest and fearfullest bully in the world, their excitable Creole hearts flared into similar action. With the Central Americans we have "made more character" in the past two years than in any previous fifty, and their friendship and their trade are ours to pick up if we will.

On the west coast, the same psychological advantage, long unattainable is now ours; and here we have not even a line of casual fruit steamers—we have practically nothing but the semi-occasional staggering old Pacific-Mailer ambling in between visits of the somnolent Pacific Steam Navigation Company and the spasmodic C. S. A. V. The Cosmos Line, an offshoot of the Hamburg-American, was rapidly absorbing all the cream of the west coast from Mazatlan to Chiloe, and the Cosmos Line is now out of business and out of favor everywhere but in Mexico. Is there any reason why the copper mined by the Guggenheims in Chile, the silver taken from the street of Cerro de Pasco by the Palmer Syndicate, the mahogany cut by American firms and floated down to San Marcos Bar and Salina Cruz should not be freighted away in American ships, built and manned in the United States? If it paid a German liner, 12,000 miles out of Hamburg, to work 42 ports from Valparaiso to San Francisco, stopping to "land a cabbage and a barrel of water and take on an old woman and a parrot," why should it not pay an American freighter, 4000 miles out of San Francisco or 2000 out of New Orleans?

The country is weary of the long feud between rail and water-borne traffic which has killed the once-glorious Mississippi and partially paralyzed the Panama Canal. Moreover, the railroads are weary and the ship-owners are weary. Indeed, this seems to be another rivalry of the past which has been made silly beyond all measure by national growth. There are not enough freight cars, and freight cars and ships together are none too much to handle the coast-to-coast business. Building many more railroads is slow and costly—the ships are in our hand. And unless those ships are used, *some good profitable coast-to-coast trade will not be carried on.* Their use, incidentally, should land a few heavy punches on the solar plexus of our national tyrant, the High Cost of Living. It should not be difficult for a government operated line to keep cargo rates at a figure which will permit the struggling railroads to carry their normal capacity and so reorganize their over-driven system. There will be enough left over after

the freight cars are laden to send more than one vessel through the Canal down to her Plimsoll Mark.

VI

The same factors which have contributed to the spectacular and world-wide collapse of the German Merchant Fleet and German-made good-will have placed ships in our harbors and good friends on our calling-list. Before the war, the ships of our Allies were working to capacity, and so were the ships of neutrals. The submarine has decreased those busy fleets, but they will be soon rebuilt. Meanwhile, there remains the huge vacancy left by the withdrawal of German ships and German friendliness.

Not a single article of commerce, not a single pound of freight has been so far mentioned in this article to which any of our friends ever laid the shadow of a claim. Our late enemies once gained this trade more by lying about us than by open competition, more by our own restrictions on our ships than by their superior merchandising ability.

The trade is there and the ships are here. Go to it, America!

VII

By this time, probably, every reader is wondering what will become of the fleet, if all this comes to pass, if the navy keeps and operates this great United States Commerce Navy. Operating modern men-of-war is not a stationary science in any of its branches, and a life time can be profitably spent in study and effort to perfect oneself in any one of an officer's many duties. The gunboat officer, though doing strictly naval work, often laments that "By the time I get back to the fleet, I won't be able to even put a name on half the gadgets I see!" While officers and men are plying around the world discharging tinned tomatoes and taking on teak wood and tea, what will become of their fighting education? If it be necessary for the regular establishment to man our Commerce Fleet, the ships must lie idle, for even in the unheard of contingency of Congress authorizing a regular navy of any such size, such duty would guarantee that a good seventy-five per cent of our expensively educated officers would soon become professionally behind the times and exceedingly mediocre in the performance of their legitimate naval duty. The Fighting Fleet must remain the Fighting Fleet, without any further amount of professionally stagnant duty than it now has of

necessity. Fighting ships, like fighting men, must be drilled, drilled, drilled until the human approximation of perfection is reached, or they are something less in value than the country has paid for. By the time a midshipman has been given a groundwork which will fit him for specialty work as engineer, gunnery officer, aviator, radio or torpedo man, metallurgist or ballistician, in addition to being a seaman and a navigator, he is far too valuable to be allowed to rust as third mate of a tramp freighter or even of the *Leviathan*. We must keep a keen edge on our sword, and we cannot do that if we use it as an axe or a hoe.

The answer has already been ably presented. The officers and crews of our government operated ships should not be selected haphazard from the Tarry-Johns of the world. They must be our officers and men, upon whom we may depend in time of war or threatened war; for modern war has made the freighter as great a factor as the fighter, and we must never again have to educate professionally our Transport and Train complement after hostilities have begun. The Commerce Fleet must be manned by a personnel just as entirely at the command of the Navy Department as are we of the regular establishment. They must form a permanent Naval Reserve. If at some future date it again becomes necessary for us to take over commercial ships for war purposes, we must not be delayed and the fleet must not be hindered by having to make crews and furnish officers for them. At the outbreak of hostilities, the navy should be called on for nothing more than divisional or convoy commanders, guns, and gunners. The ships should be ready to operate as they stand and steam, their commanders proceeding on their wartime errand without wasting more time than is necessary to get out their mobilization orders from the safe and tear open the envelope. Men and ships, the Commerce Fleet must be naval reserve. Their pay and maintenance must not be charged against the navy except when they are actually mobilized, but must be covered by the proceeds of their voyages. We must avoid even the appearance of expense to the tax-payer. He has not always the time to examine both sides of the ledger, but he is sure to see the annual total of the Appropriation Bill.

There need be no fixed period for enlistment in this reserve; in fact, if we fix a term of sufficient length to insure a solid training, we might have difficulty in recruiting. Men and officers

should feel free to leave at the end of short periods—say after a term of six months for enlisted men or a year for an officer. They must, if they so leave the service, hold themselves in readiness for call in time of war for some years afterward; and naturally they would, by so doing lose any benefits of continuous service and longevity which they might otherwise receive. Ratings for men should be as far as is necessary, the same as in the regular establishment, carry the same rates of pay and the same four-year increases. Rank for officers should grade from cadet (midshipman) up to and including lieutenant commander for the deck and engine-room in time of peace, up to and including the rank of lieutenant for the supercargoes, pursers and doctors. The control and center of this reserve must be situated in the Navy Department, and a regular officer with the rank of rear admiral and the title of Commander-in-Chief, Commerce Fleet, should be their commander-in-chief under the Navy Department. His duties, however, should have to do solely with the enrollment, detail and discipline of the reserve personnel.

The ships themselves must in the nature of their pioneering duty, be closely in touch with the internal and merchandising conditions of the country, and so our Commerce Fleet directorate cannot hope to be successful under the guidance of sea-going officers only. It must be closely affiliated with the navy, also with the Consular Corps, but more than either, it must be civilian, nonpartison and commercial. The following make-up of the board of directors, U. S. C. N., is suggested:

Chairman, *ex-officio*, the Secretary of the Navy.
The Chief of Operations (Commerce).
Elected by the Chamber of Commerce, New York ..... Two directors.
" " " " " Chicago ..... Two directors.

" " " " " Boston	One director each.
" " " " " Philadelphia ...	
" " " " " Baltimore	
" " " " " Norfolk	
" " " " " Savannah	
" " " " " New Orleans ..	
" " " " " Mobile	
" " " " " Galveston	
" " " " " San Francisco ..	
" " " " " Seattle	
" " " " " Honolulu	
" " " " " Manila	

Non-voting attachés to the Board of Directors, 8; as follows:

From the Staff of the Commander of Train, U. S. N.	1
From the Bureau of Supplies and Accounts, U. S. N.	1
From the Consular Corps, State Department	1
From the Department of Agriculture	1
From the Department of Commerce	1
Delegated by the Pan American Union	3
Two Secretaries, elected by the Board of Directors.	

Our United States Commerce Navy begins to take definite and feasible shape.

VIII

For purpose of determining cost, it would appear that the only feasible method of estimate will be to, as near as possible, average the ships into classes. Roughly we can divide our Commerce Fleet into four types, *i. e.*:

1. 2000 tons, or "Lake" class.
2. 5500 tons, or "Western" class.
3. 7500 tons, of the Emergency Fleet Corporation type.
4. Captured vessels.

An approximation of cost which will not be less than actual necessities will enable us to determine the freight tariff which will enable us to operate; and in fixing this tariff we must bear in mind that the main duty of the Commerce Navy is to open new fields as soon as possible, and that at present, tariff rates are abnormally high, and so cannot be taken as a permanent basis for figuring. Actual cost, plus twenty per cent overhead, divided by probable average tonnage of cargo must be our minimum to break even. If we have then latitude to collect a bit of interest on our investment, the tax-payer wins. If we have not, he does not lose. *Either way the country wins.* Therefore, our only real problem is to find out if we can operate without a government annual appropriation to meet expenses.

First, cost of operation and overhead. It will be necessary only to estimate on the smaller type of captured liners to discover whether they can be made to pay. Under normal peace complements and a regular run, the *George Washington* should require an annual upkeep of not more than 180 per cent of the *Antigone;* but her carrying capacity will reach 300 per cent. Consequently, if the *Antigone* can work to profit, so can the larger ships. What complement will she require, what stores, what provisions, how much coal? In the following table, I realize that most naval offi-

PROPOSED COMPLEMENT, U. S. C. S. "ANTIGONE"

In command, 1 lieutenant commander.
1 lieutenant .....
1 lieutenant, j. g..... } Deck officers.
1 ensign .....
1 lieutenant commander, chief engineer.
3 machinists or chief machinists.
1 boatswain.
1 carpenter.
1 medical officer (rank of lieutenant).
1 supply officer (rank of lieutenant).
1 pay clerk (rolls and manifests).
1 pay clerk (commissary and g. s. k.).
1 C. Q. M., 1 C. B. M., 1 C. C. S., 3 C. Y., 6 C. M. M., 1 C. C. M., 1 C. P. M. (or 14 chief petty officers).
4 quartermasters (2 1st, 2 3d c.).
2 boatswain's mates, 1c.
10 coxswains.
10 yeomen (2 1c., 2 2c., 6 3c.).
12 machinists' mates (6 1c., 6 2c.).
4 electricians.
2 carpenter's mates, 1c.
1 pharmacist's mate, 1c.
6 storekeepers, 1c. and 2c.
6 water-tenders.
6 enginemen.
6 firemen, 1c.
12 firemen, 2c.
120 firemen, 3c.
1 boilermaker.
1 plumber.
1 coppersmith.
20 seamen, 30 seamen 2c., 2 officers' stewards, 4 officers' cooks, 4 ship's cooks, 10 mess attendants.

Total, 14 officers, 288 enlisted men.

Annual pay roll	$175,000.00
Annual rations	52,560.00
Annual coal (six voyages, round trips)	66,000.00
Annual stores	50,000.00
	$343,560.00
Plus 20 per cent overhead	68,712.00
Total cost, annual	$412,272.00

cers will consider me as having sent a ship to sea undermanned, and most ex-merchant officers will consider me scandalously extravagant. I know, however, that no merchant skipper would hesitate to take the *Antigone* to sea in peace times with a crew of that size, and I believe, that *with a well-trained crew accustomed to the ship and her installations,* four guns'-crews at the outbreak of war would make her fit to do the duty she has been performing since December, 1917, as a transport.

At six voyages per year (12 runs), and allowing that the ship is loaded to an average of 75 per cent capacity, the *Antigone* should haul 60,000 tons per year. Hence we have an average haulage cost of $6.87 per ton, and must use the ship on a run where she can normally expect to receive a freight tariff slightly in advance of that. One guess is enough—remember that $22.00 per ton coffee and 110-shilling coal.

Our first regular service would look something like this:

Philadelphia to Trinidad (12 knots)....	6	days.	
At Trinidad	1	"	
Trinidad to Para	5	"	
At Para	½	"	
Para to Bahia	3½	"	
Bahia to Rio de Janeiro	3	"	, run down 19½ days.
Lay-over at Rio			4 days.
Rio to Bahia	3	"	
At Bahia	1	"	
Bahia to Para	3½	"	
At Para	1	"	
Para to Trinidad	5	"	
At Trinidad	1	"	
Trinidad to Philadelphia (or Baltimore)	6	"	, run back 20½ days.
Total round trip voyage			44 days
Overhaul			16 "
			60 ", or six voyages per year.

And so:

UNITED STATES COMMERCE NAVY

Beginning January 1, 1920, the following schedules will be placed in effect:

Philadelphia to Rio de Janeiro, via Trinidad, Para and Bahia.
Ships: *Pocahontas, Madawaska, Aeolus.* Sailings on the first and twentieth of each month.

Freight rates, to Trinidad		$ 6.00	per ton.
" " " Para		12.00	" "
" " " Bahia		14.00	" "
" " " Rio		16.00	" "
" " Trinidad to Para		6.00	" "
" " " " Bahia		8.00	" "
" " " " Rio		10.00	" "
" " Para " Bahia		2.00	" "
" " " " Rio		4.00	" "
" " Bahia " Rio		2.00	" "
Passenger rates to Trinidad		$ 65.00	
" " " Para		100.00	
" " " Bahia		125.00	
" " " Rio		150.00	

Beginning January 10, 1920:
Baltimore to Rio de Janeiro, via Trinidad, Para and Bahia.
Ships: *Antigone, Susquehanna, Huron.* Sailings on the tenth and thirtieth of each month. Freight and passenger rates as above.

That undercuts present rates by nearly 50 per cent, and in fact is below normal; and we find that we will clear, not counting any passenger traffic which may come our way, $5.13 average on 60,000 tons for each of the above six ships, or $1,846,800.00 per annum on six of our slowest and oldest ships. Interest on forty-six millions, one hundred and seventy thousands of dollars worth of Liberty Bonds.

Next, the West Coast of South America. Since the opening of the Panama Canal, and the consequent shortening of this run by some seven thousand miles, our best schedule would seem to be something like this:

From New Orleans to Valparaiso, *De Kalb, Martha Washington, Princess Matoika.* Sailings on the first and twentieth.
From Mobile to Valparaiso, *Covington, Mercury, Powhatan.* Sailings on the tenth and thirtieth.

Time consumed in voyage (12 knots):		
United States to Colon	5	days.
United States to Canal	1	"
Panama to Guayaquil	3	"
At Guayaquil	1	"
Guayaquil to Callao	3	"
At Callao	1	"
Callao to Valparaiso	5	"
Layover at Valparaiso	5	"
Total length of voyage	43	days
Overhaul	17	"
	60	days, or six voyages per year.

As the above ships will perhaps average a few tons less than the Rio ships, we cannot expect to clear more than a million and a half from this run; but that accounts for the interest on $37,500,000.00 more Liberty Bonds.

Our traffic *de luxe* must necessarily be between New York, Montevideo and Buenos Aires, and on this run we will put our best, *George Washington, Agamemnon, America, Mt. Vernon, President Grant,* and *Von Steuben.* They will sail every ten days, and they will average 16 knots while under weigh. They will touch at the same ports as the Rio ships, in order to allow those who wish to pay for a luxurious passage to give up their money, but the bulk of their work and practically all of their freight will come from the far end of the run at the maximum charge of $18.00 per ton. This line figures to a clear netting of two and a quarter millions per annum, even at its enormously increased coal consumption, and takes care of over fifty-six millions more of our bond-debt.

It is not claimed that the initial voyages will produce revenue at any such rate. It is stated unequivocally, however, that as soon as the ships appear, the waiting market will begin feverishly to work to keep them on the run, and that within twelve months we will be loading very near to full capacity. Does anyone who has recently visited South America dispute it?

7500-Ton Class

The complement of these ships can be reduced easily by four officers (2 pay clerks, 1 watch officer, 1 machinist or chief machinist) and 125 men, leaving them to operate with ten officers and 163 men. Estimating their pay and rations on this basis, their coal consumption as the same and their necessary stores at 75 per cent of the passenger vessels, we get an annual upkeep and overhead of $275,400.00. In other words, to pay for themselves, they must haul an annual 55,000 tons at an average of $5.00 per ton. Fifty-five thousand tons is eleven normal, one-way runs of such a ship, and when the length of the usual $5.00 per ton water-haul is considered, eleven runs per year is a very lazy rate of working. These vessels will be the last of our freighters to leave the European lanes in normal course, and perhaps they never will leave them. If they do, there is plenty of tea in Formosa to load

them to their last ounce at considerably more than five dollars per ton, and when the tea is gone, there is camphor, there is sugar from Honolulu and all the loot of the China coast, north and south, and there are the Southern Islands. We will never lose money on these ships.

With the "Western" type of ships our coal consumption and complement upkeep drop rapidly in comparison to haulage. A payroll of $45,000.00, rations of $14,500.00, coal and stores not over $50,000.00 plus our 20 per cent overhead, make them cost us $131,400 per year apiece, or 27,000 tons at $5.00 per ton. Ask anyone in Argentine, ask the Guggenheims, ask the Palmer Syndicate, how much freight they can give us at twice that figure to any Atlantic port. Ask any of them how many times 27,000 tons per year we may count on from the jogging, port-to-port, cabbage-and-barrel-of-water trade around, through the Canal and back? The "Westerns," moreover, are ideal copra ships.

Every little "Lake" ship we own will find herself busy at home and visiting the near neighbors. Coast-to-coast and the West Indies and Central America furnish the field of endeavor for these little fellows, and at the year's end, they will be turning in a balance sheet that will cause our swagger passenger trade to shake its head and read the figures over again.

When we have finished our first twelve months as international merchants, only the worst of luck coupled with an extraordinary visitation of business stupidity—and this has never been counted an American weakness—will prevent us from realizing that we have: (1st) More friends and better ones; (2d) much more trade and more profitable trade; (3d) a dependable, sizable naval reserve which has cost us just exactly nothing. And last, but not least, we are apt to find that we have taken the First Liberty Loan off the hands of the tax-payer entirely, are paying him his interest and laying up his principal against the maturity of his bonds.

We must prepare the plans and be ready to answer the questions of Congress. Do you believe that they will hesitate to give us free rein in this matter, once it is fairly put up to them? A great deal has been said in the public press about every Congress from the first to the present assembly; but among those things has never been an accusation that they refused to permit lawful, legitimate dollars to enter the Treasury of the United States. A

great many gentlemen are gravely stating that the United States cannot profitably compete with the shipping of other nations. Perhaps not, but here, in our hand, is opportunity to make our ships profitable while avoiding competition with that shipping.

The opportunity is fleeting. In five years it will no longer exist. In two years, if America acts quickly, the firm of "America and Sons, Shipowners," will be the greatest dividend-paying concern in the world. Can America afford to bury her talent?

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

AUTOMATIC GUNS

By First Lieutenant King H. Young, U. S. M. C.

Among those not intimately connected with their manufacture or use there has long been a marked inability to differentiate between the various types of automatic guns. To the lay mind any self-operated weapon firing rifle ammunition is a *machine gun* and nothing else. It is quite natural that this erroneous impression should exist, as very little descriptive matter on this subject has been written except in official orders and in technical publications designed for the use of specialists.

The British classify automatic guns according to the manner in which they are fed, operated and cooled: An automatic rifle is magazine- or clip-fed, gas operated and air-cooled, while a machine gun is belt-fed, recoil-operated and water-cooled.

The War Department has designated as "automatic guns" all automatic firearms which fire a rifle cartridge, dividing them into five classes, viz.: Self-loading rifles, automatic rifles, machine rifles, aircraft machine guns and machine guns. The first and fourth types need not here be discussed, as no self-loading rifle has so far been adopted, and as aircraft machine guns are special types designed only for mounting on aircraft.

Automatic rifles are defined as automatic guns of such light weight and of such construction that habitually they are, or may be fired from the hip or shoulder in much the same manner as the magazine rifle. Types of automatic rifles are the Browning (light), Chauchat, Hotchkiss (light), and Berthier (with light barrel).

Machine rifles are automatic guns of an intermediate class between the automatic rifle and the machine gun. The cooling system of the machine rifle usually is more effective than that of the automatic rifle, and hence the machine rifle is capable of maintaining a sustained fire of longer duration than the automatic rifle. Its cooling system is not of great enough efficiency, how-

ever, to permit of long sustained fire at rates of 150 or more shots per minute without an undue increase in dispersion. The weight of the machine rifle, or its construction, or both, usually are such that habitually it cannot be, or is not, used as a hand arm as is the automatic rifle. Types of machine rifles are the Lewis, Colt, Benet-Mercier, Berthier (with special radiator), and Hotchkiss (heavy).

Machine guns are water-cooled automatic guns which, because of the efficiency of their cooling systems and the stability of their mounts, are capable of accurate and long-sustained fire at rates of 150 or more shots per minute, and this without any increase in dispersion that would endanger friendly troops over whose heads their fire may be directed. Types of machine guns are the Browning (heavy), Vickers, and Maxim.

The importance of distinction in the use of automatic guns can be no more accurately presented than in the language of W. D. Doc. 836, "Tactical Use of Machine Guns," A. E. F., France, 1918, where we find that "a clear understanding of the characteristics of machine guns is absolutely necessary to their correct tactical use. *A confusion of ideas as to their powers and limitations will lead to a failure to utilize them to the fullest extent, or to positive disaster by expecting from them functions which they are not capable of performing.*"[1]

EMPLOYMENT

The automatic rifle is primarily a platoon weapon and is incorporated in infantry organizations.

The machine rifle is fired from a light mount and, while capable of firing for a longer period than the automatic rifle, has not the mobility and cannot keep up with the infantry. Like the automatic rifle, it is susceptible of use only in direct fire and can never be employed as a machine gun.

The machine gun is mounted on a tripod, weighing approximately 50 pounds. The legs are weighted with sand bags, so no matter how nervous the firer, the rigidity of the mount entirely eliminates the personal factor.

The fire of a machine gun is equal to that of 100 rifles, yet the space occupied is as one is to fifty. It depends for effect upon surprise and likes a deep, dense target.

[1] Italics are mine.

The mobility of the machine gun depends greatly upon ammunition and water supply. Water is carried in breakers weighing (filled) about 12 pounds. It is essential that water be clean in order to prevent corrosion.

While the equipment of the machine gunners will not admit of keeping pace with infantry, it can be carried any distance and to any point reached by the infantry.

The machine gun is capable of rapidly producing and applying a large volume of concentrated and accurate fire. Because of its rigid mount it can employ the same types of fire as artillery. Nine-tenths of its fire is indirect, the most important type being overhead barrage fire.

Data is calculated for this fire in much the same manner as obtains in artillery, with the use of some adaptation of the mil formula, when a map is not available. Take the TOG method:

$$\frac{(t \times OT) - (g \times OG)}{GT},$$

When the target cannot be seen by the firer (No. 1) the machine gun officer, accompanied by the Range Finder Sergeant, takes up a position (O) where both a flank gun and the target can be easily seen, which position must be visible to No. 1. By means of the prismatic compass the slopes from O to target (t) and gun (g) are taken, and the mil bearings recorded. The angle of site is the algebraic sum of $(t \times OT) - (g \times OG)$. The angle of quadrant elevation is found by adding this angle to or subtracting it from the angle of tangent elevation (angle of departure) depending as the target is above or below the gun.

The ranges to target (OT) and gun (OG) are read, and the angle TOG plotted on a scale of about one inch to 100 yards. The triangle is then completed and the range scaled. The angle OGT is read, and No. 1 lays on O, turning off the angle found in the direction of the target. The elevation is then put on. Frontages of battery and target are paralleled and angles of concentration or distribution given.

Machine guns are always used in battery in this type of fire.

When one is available, the data is calculated from a map and recorded on charts similar to those appended. The most notable instance of the successful employment of indirect overhead barrage fire during the war was at the Battle of Messines, where 144 guns were used and nearly 3,000,000 rounds fired.

INDIRECT OVERHEAD FIRE SHEET

No. 165 M. G. Co. No. One section: Date, Sept. 13, 1918.
Map used, Verdun

ELEVATION									CLEARANCE				
Gun position Map location	Target Map location	Direction	Range to target	Contours Gun	Contours Target	V. I. plus or V. I. minus	Q. E. table	Range for Q. E. table CO_1	Contour of own troops	V. I. between gun and own troops	Range to own troops	Trajectory height table	Clearance obtained	Table of safety clearances
A12b 3036	B13d4706 to B14c0012	SE	2250	125M	112M	13M	320	2200	116M	8M	910	56	65	600–11X 700–13X 800–15X 900–17X 1000–20X 1100–23X 1200–27X 1300–31X 1400–35X 1500–40X 1600–46X 1700–53X 1800–60X 1900–69X 2000–80X
														Grid bearing of zero line.

BATTERY CHART. A BATTERY

Composition 1 and 2 sections, M. G. C. Frontage of battery 70 yards
Commanded by Lieutenant L. Brown. Grid bearing to R. O. 189°
Location of directing gun B7b8792. Zero line B7b8726 to A18d8460
No. of directing gun 8. Grid bearing of zero line 210°

No. of barrage	No. of guns	Targets	Clock time	Zero time	Angle of switch	Distribution angle	Range	V. I.	Q. E.	Range to F. T. when barrage lifts	Clearance when barrage lifts	Rate of fire
A	1 to 8	A18d8460 A18d2380	4.03 to 4.06	Z to Z+3	....	1°	1880	−2M	219	1425	30	100 pm
B	1 to 8	A18d8460 A18d3624	4.07 to 4.10	Z+4 to Z+7	....	7′	1880	−4M	208	1625	19	Do.
C	1 to 8	A18c7429 A18c2583	4.11 to 4.14	Z+8 to Z+11	9°30′	55′	2380	−8M	281	2025	60	Do.

....	8	7	6	5	4	3	....	2	1	....	....	....
....	0	1°	2°	3°	4°	5°	....	6°	7°	....	....	....
....	0	7°	14°	21°	28°	35°	....	42°	49°	....	....	....
....	9°30′ R	10°25′	11°20′	12°15′	13°10′	14°10′	....	15°	15°55′	....	....	....

GUN CHART

No. 4 gun. A Battery. Gun commander: Lieutenant A. Jones. Grid bearing of zero line

No. of barrage	Clock time.	Zero time	Angle from zero line	Q. E.	Traverse	Rate of fire
A	4.03 to 4.06	Z to Z+3	4°	219	2°	100 pm
B	4.07 to 4.10	Z+4 to Z+7	28′	208	2°	Do.
C	4.11 to 4.14	Z+8 to Z+11	13°10′	281	2°	Do.

CHART OF CONCENTRATION POINTS

No. of point	Angle from zero line	Q. E.	Remarks
1	4°	219	Z+2 to Z+3

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ELIMINATION OF COUPLING TROUBLES IN MAIN SHAFTING

By LIEUT. COMMANDER J. K. ESLER, U. S. Navy

1. Continuous operation, or almost continuous operation of machinery at designed full power for any length of time is almost certain to disclose defects or weak parts of that machinery. Naval vessels, and many others as well, were subjected to these conditions during the recent war. While the percentage of vessels whose machinery was not equal to the continued strain was comparatively small, a number of vessels did require repairs of a more or less urgent nature. Some of these repairs were beyond the capacity of the ship's force, and it became necessary for these ships to go into dry-docks at navy yards. The repairs in dry-dock consisted principally of shaft repairs, and by far the greatest trouble with shafting, aside from routine re-wooding of bushings, etc., was experienced with outboard couplings. If these constitute a weak point, as they evidently do, it may be possible to improve them.

2. Since the adoption of marine machinery and propellers, the engine and the propeller have fought continually—the engine to turn the shaft, and the propeller to keep it from turning. This conflict of forces is nothing less than a great battle, with science and invention endeavoring to aid first one and then the other belligerent. In the meantime the shaft—as you may imagine—is "torn between two emotions." At one end the engine turns it, at the other the propeller resists the turning, pushing against it, and—driving the ship. The shaft, made up of sections bolted together with couplings, and supported in bearings throughout its length, is acted upon by an almost infinite variety of forces—forces tending to turn it, forces tending to compress it, forces tending to bend it, and (when the ship backs), forces tending to stretch it.

3. For this very reason shafts are constructed with ample allowance for strength. With slight variation for different types of installation, there are the following sections: main engine shaft, thrust shaft, one or more sections of line shafting, the stern tube shaft, and the propeller shaft. The couplings securing the end of these sections to each other, are of the same type for the engine, thrust, and line shaft sections, and consist of a flange shrunk or forged on each end of each section so as to be practically integral with it. These flanges are bolted together with through-bolts so that the shaft is continuous, with very little additional weight, and if anything, with greater strength at the couplings. The stern tube section is secured to the after end of the line shafting by a special sleeve fitting over the forward end of the stern tube shaft and bolted to the flanged end of the line shaft. This sleeve is kept from turning on the shaft by longitudinal keys, fitted between the shaft and the sleeve. It is prevented from pulling off, or moving lengthwise along the shaft, by a locking ring, or by segments of a ring, which fit into a grooved recess in the shaft. This construction is used so that the end of the shaft will not be enlarged, and so that the shaft can be drawn outward through the stern tube if desired. In some ship yards (Newport News, for instance), it is customary to force this sleeve on the shaft while heated. Any one can imagine the enthusiasm with which the task of removing one of these coupling sleeves is approached in a navy yard. One of the inboard couplings of the U. S. S. *Michigan* resisted all efforts for about a week, although a force of approximately 60 tons was applied, and the coupling finally had to be cut off, and a new sleeve forged. This coupling had been forced on cold, over a .003 inch, to .004 inch difference in diameter. These couplings do not, as a rule, cause much trouble in operation. The chief trouble develops when it becomes necessary to remove the coupling in order to withdraw the stern tube section of the shaft. The other special coupling, outside the hull, causes more trouble.

4. The coupling between the stern tube shaft and the propeller shaft is the heaviest, and probably the strongest part of the whole shaft. Owing to its inaccessible location, outside the hull and under water, special precautions have been taken in its design and construction. There are two general types in use. The one most in favor with naval men consists of a hollow cylindrical sleeve, tapered inside to fit a special taper on the ends of the shafts. Two

opposite longitudinal keys between the shaft and sleeve, keep each end from turning in the sleeve. Cross keys through each shaft, and the sleeve, draw the ends into the taper and keep them from withdrawing. This type gives general satisfaction, the only troubles experienced being due to keys working loose, fractures caused by too tight a fit at the sides of cross keys, etc. In the other type the sleeve is made in two halves, bolted together along the sides. The shafts are prevented from withdrawing by a single locking ring in halves fitting into annular recesses in both shafts and into a recess on the inside of the sleeve. Longitudinal keys keep the shafts from turning in the sleeves. A great deal of trouble has been experienced with this type, arising from crystallization of the bolts, in spite of the fact that the strongest materials, even class "A" nickel steel forgings, have been used. The importance of these couplings and their inaccessible location, make it essential that their design and construction should embody the best that mechanical science and experience afford.

5. An impartial "estimate of the situation" makes it clear—strange as it may seem—that the greatest trouble in shafting occurs at the heaviest and strongest part. It is possible that an investigation of the forces of vibration in the shaft will disclose the reason why this particular part should cause so much trouble.

6. Vibration may be divided into three general classes: transverse, longitudinal, and torsional. Different parts of the shaft are subjected to stresses in various directions. Each crank-pin of the reciprocating engine tends to force the shaft in a direction dependent on the angle of the cranks to each other. The shaft is restrained by bearings between each crank. The fact that these bearings are equally spaced along the shaft increases the tendency of the shaft to spring, the amplitude being equal to the distance between bearings, the nodes being at the bearings, and the frequency depending upon the speed of revolution. This tendency, started at the engine, travels through the length of shaft until it reaches the heavy outboard coupling, and this coupling is of such heavy construction that the vibrations are damped—absorbed. The end of the shaft tries in vain to shake itself free in the coupling. If the bearings are not in exact alignment, or if some are down more than others, there is a tendency for the shaft to sag or to be bent at these points. As the shaft revolves, it tends to bend successively to every part of its circumference. This causes

the same transverse vibration of the end of the shaft in the coupling sleeve. Moreover, aside from its weight, there is another factor tending to cause the vibrations to be absorbed in this coupling. The propeller, turning in water affected by the wake current of the ship, by currents diverted by the rudder, and by the greater pressure of water at the bottom than at the top, has a tendency to spring the after end of the shaft. The supporting strut bearing is not tight; it permits slight play of the shaft. This transverse vibration, being dependent upon so many uncertain features, can hardly coincide with the vibrations in the remainder of the shaft, and these vary with the speed of rotation. Is it not natural to suppose then, with the propeller shaft trying to shake itself loose in one end of the coupling sleeve, and the stern tube shaft endeavoring to shake itself loose in the other, that great and unknown stresses are set up at this point?

7. As the propeller turns over, the force required to turn it and the thrust which it delivers to the shaft vary with the currents in the water in which it turns. This variation is for the most part periodical, and dependent upon the resistance encountered by each blade as it passes the points of unequal resistance. The thrust then becomes a sort of pounding, varying a little above and a little below the mean thrust delivered to the shaft. But the shaft is held from longitudinal movement, however slight, by the thrust bearing. Once the thrust collars are tight up against the thrust shoes, no further longitudinal movement is possible. *The shaft vibrates in length*, and this vibration is also absorbed in the outboard coupling. The stress exerted in the coupling sleeve may be likened to the action of a wedge subjected to vibrations. The tremendous force which may be exerted by a wedge is not dependent entirely upon overcoming skin resistance between the wedge and the faces it is forcing apart. The wedge itself contracts in length and expands in width on being struck by a sledge. It is evident that the pounding effect of unequal thrust in the shaft exerts a very similar stress upon the coupling sleeve. And in much the same way the inequalities in water resistance affect the uniform rotation of the propeller.

8. Thus, torsional vibration of the propeller shaft is due to unequal delivery of torque by the propeller, even though the torque delivered to the shaft by the engine is uniform, as in turbine and electric installations. What place in the shaft is most

likely to receive the full benefit of vibrations caused by momentary differences between the torque applied and the torque delivered? We conclude that the outboard coupling, because of the great weight concentrated on this one part of the shaft, absorbs almost all the vibration of the shaft. There must be some means of diverting these vibratory effects from this inaccessible location.

9. Is it possible to distribute the shaft vibrations throughout the length of the shaft? Would this decrease our shaft troubles?

10. To distribute the vibrations throughout the total length of shaft requires that the shaft be made practically uniform in weight and strength. The solid couplings used on line shafting give practically no trouble and have the advantage of parallel opposing faces to assist in checking alignment of the shaft. If these couplings could be used in place of the special outboard and inboard couplings now used, the shaft would be uniform in weight and strength throughout its length. The deterrent factor is the necessity for withdrawing the stern tube and propeller sections of shaft through the stern tube and strut bearings. Can the stern tube and strut be modified to permit the removal of these sections if fitted with flanges? They would have to be enlarged about 8 inches, in diameter. Clearly it is impracticable with ships with built-in stern tubes. But new struts might be fitted. This would eliminate the necessity for the outboard coupling. It is believed that the bushings which fit into the stern tube and strut to form the bearing for the shaft, could be fitted into a sort of distance bushing, about 4 inches thick, fitted to the inside of the stern tube and strut. These bushings would not be removed except when necessary to withdraw the shaft. It is more than probable that this is entirely feasible in future construction, and that the advantages offered to ships at present in commission may warrant the installation of new struts incorporating this feature, and eliminating the present type of outboard coupling.

11. This would mean, then, that for new construction, the stern tube would be about 8 inches larger in diameter, and that in each end would be fitted a distance bushing of brass, 4 inches thick, cored and ribbed for lightness and strength. The familiar wooded bushings would fit inside the distance bushings in the same way in which they now fit in the stern tube. The struts would be changed in the same way, except of course, that only

one distance bushing would be required for each strut, while two would be required for each stern tube. This feature of construction is suggested as a means of distributing the vibration throughout the full length of the shaft.

12. It is, of course, possible that more thorough investigation and experiment may disclose some better method. But before we attempt to estimate this possibility, let us consider the remaining factors.

13. First, reduction of vibrations caused by the propeller would seem to be improbable. Many types of propellers have been used in the navy. The present type is the result of endless calculation, experiment, and trial. The vibrations which originate at the propeller are not caused by any fault of design or construction. They are the result of unequal areas of pressure of water against the blades, and it is extremely doubtful if any means will ever be provided to improve this condition.

14. Secondly, while the vibration caused by the engine has been reduced to what approaches a minimum, there still remains the shaft vibration, which no engine design can eliminate. Yet the more modern the engine, the more imperatively does its increase of power demand the elimination of vibration. Great strides have been made toward eliminating vibratory stresses caused by the engine. The newer installations, turbine direct connected, turbine with reducing gears, and electric drive, all provide a uniform torque and practically no transverse pressure on the shaft. These advances in main engine installation, however, bring increased power as well, and while the general result has been a great improvement in shaft vibration, the newer installations require even less vibration that at present, for more satisfactory operation. It is readily understood that an old reciprocating engine will " mote " even if the shaft is shaking around a good deal, while a high speed turbine or an electric motor would rack itself into pieces under the same conditions. This only serves to illustrate the difficulties attendant on the " war problem " confronting engineers at each step of progress in marine engineering. To revert to the conflict of forces, amounting to a continual battle between the propeller and the engine, we may say that the engines now have the advantage. There is no improvement in sight for the propeller. The only way in which progress can be facilitated appears to be by improvement in the shaft.

15. The causes of shaft vibration have been treated very briefly. It has been shown that torsional and longitudinal vibration do not disappear with uniform application of torque. It is to be expected that vibration will be present in future installations, though it will undoubtedly decrease as installations become more mechanically perfect. If this vibration can be distributed throughout the total length of shafting, whether by the method of eliminating concentration points at heavy couplings, as suggested in this article, or by some other practicable method, it is certain that the many difficulties experienced with present shaft installations will be greatly minimized, and some at least, will be completely eliminated.

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A WRINKLE IN TACTICS

By Lieut. Commander R. F. Wood, U. S. Navy

1. Among the maneuvers most frequently encountered is that wherein the line of bearing of ships is altered.

2. It is well known that if you are the leading ship in column and are ordered to take position on the bow of a ship in the column astern, that you readily reach the designated location by turning to that side by an amount equal to the bearing assigned. Maintaining standard speed, your distance from the guide remains the same.

3. Fig. 1 shows this condition graphically.

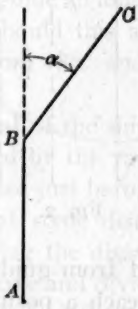

Fig. 1.

4. If B changes course by the given bearing a she will reach C at the same instant that guide A advances to point B. Thus B has reached a new line of bearing at the standard distance using standard speed.

5. It may not be so generally known that a like relation obtains when the ship ahead happens to be on a line of bearing other than 0°. Such however is the case, and by the use of this knowledge

a simple thumb rule will suffice and instead of the necessity for the use of the mooring board, the desired change of course is had instantly.

6. Referring to Fig. 2 the problem may be stated.

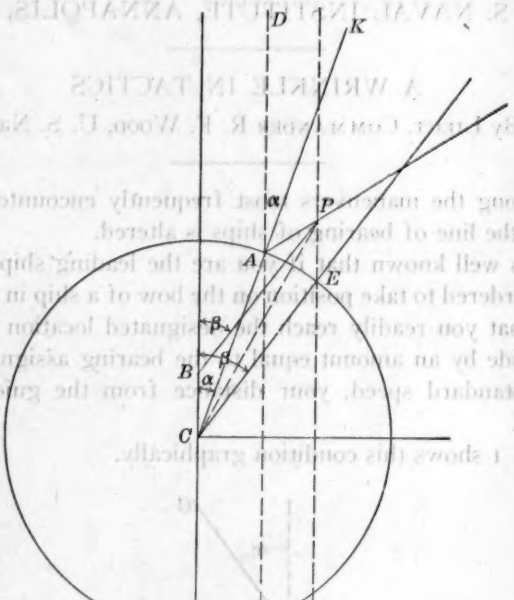

FIG. 2.

7. Ship at *A*, distant *CA* from guide *C* and bearing from the latter angle α, desires to reach a position bearing angle β from guide at a distance equal to former distance *CA*. Assume equal speeds.

8. Let ship stand on such a course from *A* that at a given instant she arrives at a point which bears angle β from guide at distance required. Call this point *P*.

9. In the figure *CB* and *AD* represent the original course. Angle *DAP* is the angle between original course and course to desired point *P*. We wish to find a value for angle *DAP*.

10. Draw *CP*.

11. Then in triangles CBP and CAP

$CB=AP$ (for at equal speeds C moves to B while A moves to P).

$BP=AC$ (P being such a point that it bears angle β from guide at same distance as before).

$CP=CP$ (being common to both triangles).

Therefore triangles CBP=triangles CAP and

Angle CBP=angle CAP.

But angle $CBP=180-\beta=$angle CAP.

and angle $CAP=180-KAP$.

Therefore $180-KAP=180-\beta$.

Angle $KAP=$angle β.

But angle $DAK=$angle α (Ext. angles parallel lines).

And angle $DAP=DAK+KAP$.

Therefore angle $DAP=\alpha+\beta$;

which value was sought.

12. So, at same speed as guide, to move to a new bearing from guide greater than that already held, at same distance, simply change course away from guide an amount equal to the *sum of the old and new bearings*. Should this angle be greater than 180° it is simpler to subtract from 180° and turn toward the guide by this amount.

13. In practice the arrival of the ship at P is determined by the use of the pelorus, checked by the rangefinder for distance, the ship turning up to her course just before the bearing and distance are obtained. For runs of some distance the time required is quickly found by multiplying the distance between tracks by the cosine of the change in course and dividing by speed.

14. Those interested will find the above rule to apply also to some cases where the bearing is altered from one bow of guide to the other, or from one quarter to the opposite. However, in doing any of these stunts do not forget that the guide is a ship and not a point on a line.

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MODEL MAKING

By COMMANDER C. S. McDOWELL, U. S. Navy

FOREWORD

It is probable that many officers in the navy have, while in London lately, seen the races, on Sunday, of model yachts in Hyde Park and investigated the subject sufficiently to discover the wide interest and enjoyment which is taken in this sport by large numbers of people in England. It is not improbable that the greater interest in boating and water sports and pursuits, as compared to this country, which is found in all classes of society in England, has been fostered and encouraged, by model yacht building and racing.

At the present time there are many officers and men of the naval reserve who have returned, or are about to return to civil life. Many of these have acquired a certain knowledge and interest in the sea, which they would like to retain.

In the navy, to obtain the name of a "smart ship," the crew must be instilled with a ship's spirit based on common hopes, experiences and traditions. With the frequent changes that have been necessary, of late, in personnel especial efforts are required and should be made to obtain such a spirit. A "smart ship" used to be identified by the smartness of her boats, and ship's spirit was encouraged by sailing and pulling races. While, under present service conditions, it is not possible to devote as much time as formerly to boat drills and boat racing, it is possible on ships of every class to build and race models. Thus races may be held between divisions as well as between ships, and by requiring all model yachts to be home-made an interest in the sport is afforded and much useful knowledge acquired.

With the thought that this subject might be of interest to those who have seen something of the navy and acquired some of the

spirit of the sea, and have now gone back to civil life, as well as to those who remain in the service, a few notes on model making have been written up at my suggestion by Ensign Lewis F. Herreshoff, U. S. N. R. F., of the well-known firm of yacht builders.

HISTORY

Model making as far as is known dates back to the Egyptians, and the art was practiced throughout the ages in all nations, as

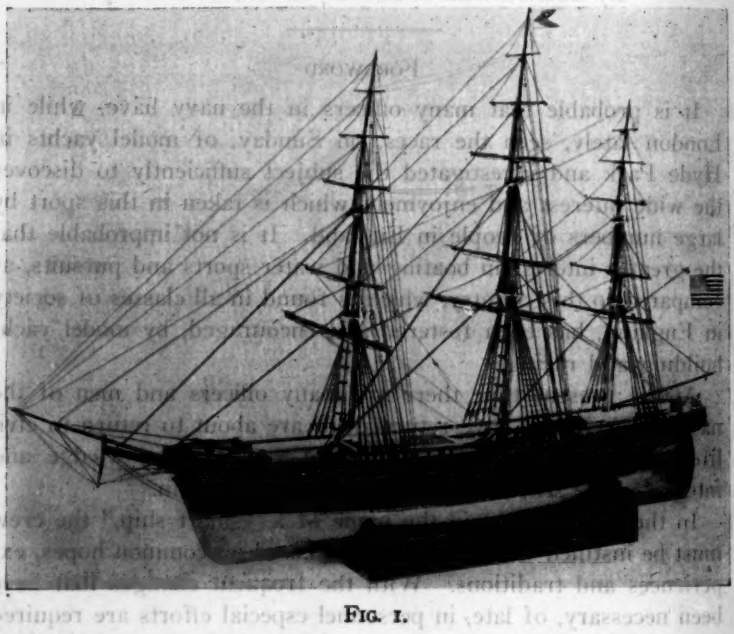

FIG. 1.

may be seen by the wonderful examples of model making in various museums. In our own country, such museums as the East India Society in Salem, Mass., and the Historical Society Museum in New Bedford display models, some of which were made at sea. One of the best of them all is a little bone model made by Yankee sailors, while prisoners-of-war in an English prison during the Revolution. It is said to be made from beef bones saved from the food, and is certainly a very fine piece of work. Evidently there were many sailors in the years gone by who could make exact duplicates of the ships they had manned, and it

is believed that there are also men to-day who could do the same if they were properly encouraged. It certainly would make them take a keener interest in their own ship, and give them a higher regard for material and a greater pride in their ships than is now the case in our navy. A model of one of the old sailing ships is shown in Fig. 1.

TYPES OF MODELS

Generally speaking, models can be divided at the present time into four classes, which may be described separately as:

(1) Exhibition;
(2) Sailing;
(3) Power; and
(4) Experimental and Designers' Models.

Exhibition models are, of course, small reproductions and should be built to scale since nearly as much depends upon the exact proportion of parts as upon the workmanship, for, no matter how fine the work, the effect can be entirely spoiled by some part that is not to scale. There is no limit to the amount of fine work that can be put in on an exhibition model; and in making one it should first be decided how much detail the amount of time to be spent, will allow, and what the tools and skill of the builder will be capable of accomplishing. The best material for the larger parts such as the hull, deck houses, etc., is well-seasoned pattern makers' soft pine. The smaller parts, such as rails, hatches, spars, etc., can be made of some hard fine-grained wood such as mahogany or boxwood, or, if desired, ivory. The very small pieces should be made of metal and can be painted to represent any material. The kind of glue used is very important, for it often happens that glues of the fish variety are not reliable. For most work, however, "Amberord" will be found satisfactory. Pins are useful for small fastenings, and especially very small ones, called ribbon pins. The tools for this class of work luckily are all small, and requiring little room, they can be conveniently stowed.

For those who are interested in engineering perhaps there is the largest field of all, for there is nothing more attractive than a model steam engine.

There are no small fittings or parts for model work now made in this country, although there are several firms in England who

can supply nicely proportioned and perfectly practical fittings of all sorts, engine parts made to several scales and every sort of deck fittings.

SAILING MODELS

Sailing models afford much the most fun, for they are nearly as good for racing as full-sized boats. They must, however, be of quite different proportions from large boats, as they have much greater speed in ratio to their length. The wind would be almost a hurricane as it is not reduced with the size of the model. Consequently, sailing models must have as straight lines as possible, much reduced sails, and deeper keels. They also should be of

FIG. 2.

certain proportions as to depth and width of hull, so that the curve of the lines that run under the bottom may be of about the same radius as the ones along the sides, because when the boat keels over a change in her lines is apt to make her try to turn to one side. For example, a wide, shallow-hulled boat will head up when she keels over, while one of the deep, narrow or cutter type will invariably swing off. A good example of a sailing model is shown in Fig. 2.

Concerning rules for measurement, probably the simplest is that limiting the sail area; for all other rules are apt to produce types that are exaggerated in some dimensions which are not measured.

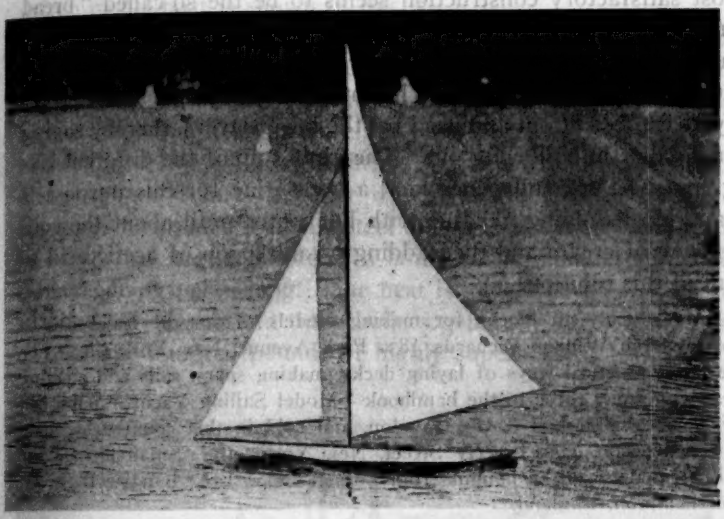

FIG. 3.

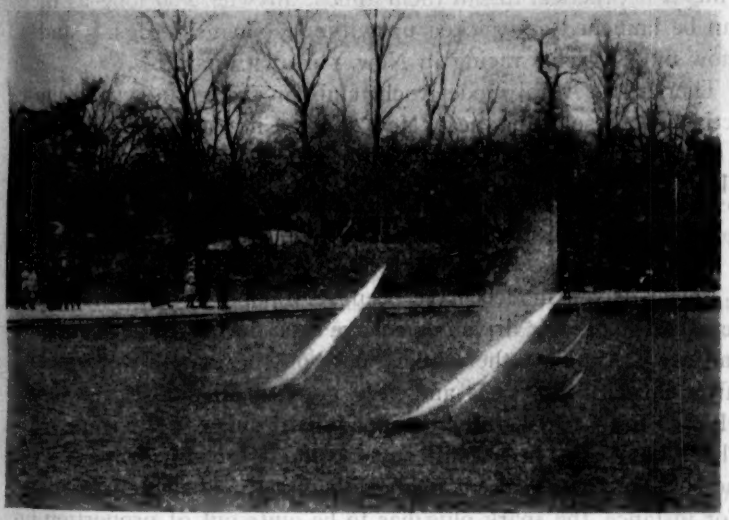

FIG. 4.

White pine is the material generally used for the hull, and the most satisfactory construction seems to be the so-called "bread and butter" system, which consists of layers of boards cut out to shape, corresponding to the different water line elevations and glued up in correct order. The interior of the upper and larger layers can be cut out and used for the lower layers, thereby saving much labor in hollowing out. The gluing up of the different layers must be carefully done, and a good glue for this purpose is made by dissolving gelatine with hot water until about the consistency of cream and then adding a tablespoon of acetic acid to pint of this solution.

NOTE.—Ready-cut blocks for making models of several scales can be bought from William Richards, 1836 Park Avenue, New York City. For the latest practical ways of laying decks, making spars, sails and steering gears, one may refer to the handbook "Model Sailing Yachts" published by Percival Marshall & Co., London, and sold in this country by Spon & Chamberlain, 1235 Liberty Street, New York City. Small fittings for sailing models can be bought from Bassett Loke, Ltd., Kingswell Street, Northampton, England.

A good, properly designed model of any size over thirty inches will sail in the roughest water nearly as well as in a smooth pond. Thus it is practical to sail them almost anywhere so long as they can be launched and picked up without damage. Figs. 3 and 4 show model yachts racing in New York City parks.

There are several model yacht clubs in this country, the most active of these being near New York City, and including the "Prospect Park Model Yacht Club," the "Yankee Model Yacht Club" and the Club at Central Park.

POWER MODELS

Power-driven models have been very popular in the last few years. The electric driven ones have been developed considerably and are fairly fast, there being now on the market very small, large capacity, dry cells and very good small motors for those who wish to make fully equipped battleships, destroyers, etc. There have also been built some well designed gasoline-driven models, but these present many difficulties in their construction. For instance, the spark plug has to be quite out of proportion in order to make the insulator thick enough so that the spark will not jump across. Also,, the small carburetor must be of different

construction than is the practice with full-sized engines. A power-driven model boat is shown in Fig. 5.

For those who are looking for speed the steam-driven boats have been fairly in the lead during the last few years. Most of these boats are of the extreme hydroplane type, are about 40 inches long, weigh less than eight pounds, and are driven by a two-cylinder, single-acting engine of $\frac{3}{4}$ of an inch bore and stroke. These have a flash type boiler which consists of a coil of five-sixteenths of an inch seamless steel tubing of about 20 feet length, so coiled that it goes inside of a boiler casing about four inches diameter by 8 inches long. The heat is generated by a powerful gasoline blow-torch and these boilers generally carry a pressure of over one hundred pounds of highly superheated steam. It is

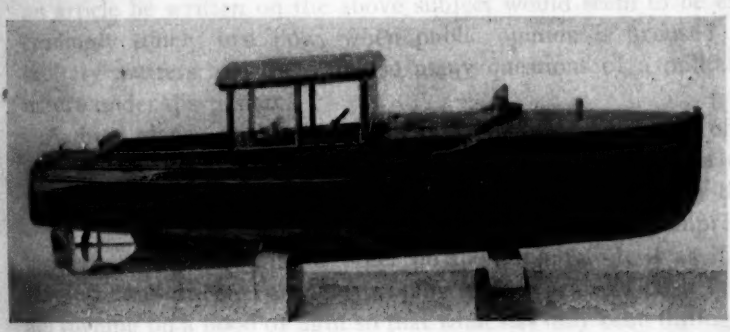

FIG. 5.

possible with some of these models to make the amazing speed of 25 miles an hour. There is at present very keen competition over the speed record of boats of this type.

NOTE.—Photographs and accounts of some of the fast American boats of this type have been published in the *Every Day Engineering Magazine*. The English boats have been described in the magazine *Model Engineering*, which is sold by Spon & Chamberlain, 120 Liberty Street, New York City.

EXPERIMENTAL MODELS

Models for experimental work have been used by all of the best naval architects in the world, and through their use new types of ships have been developed at little expense. Nearly as accurate comparisons of resistance can be made by any one in a

power boat as those arrived at in the model basins, by simply making models of exactly the same weight and towing them in pairs from a carefully balanced yoke held out from the side of a power boat on a pole.

Designers' models are generally made half breadth and are used for obtaining measurements for calculation, laying off plating, etc., and most of the best shaped ships have had their building measurements taken directly from a model.

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RESPONSIBILITIES AND DUTIES OF NAVAL OFFICERS OF THE UNITED STATES IN EDUCATING AND INFORMING THE PUBLIC ON PROFESSIONAL MATTERS

By Lieut. Commander V. N. Bieg, U. S. Navy

The suggestion by the Board of Control of the Institute that an article be written on the above subject would seem to be exceedingly timely just now, when public opinion is aroused in military matters and there are so many questions of a military nature under discussion.

A mere glance at the title must, in the case of numerous officers in the service, cause crystallization into a definite idea of those vague and indistinct thoughts on this subject, which by the very nature of service surroundings and experiences impress themselves at some time or other on their minds. It is as if a guiding hand directed a finger groping in the dark to a push button turning on a flood of light so that what has only been flittingly and indistinctly seen before is made plain and clearly defined.

That deplorable ignorance exists regarding the very *raison d'être* of the navy, its character, its war and peace time work, its thousand and one varied activities, even its uniform, is a commonplace and cannot be denied. Indeed, manifestations of this ignorance come to the attention of naval officers almost daily. Of course, it must not be understood that the writer is on this account attempting to assume the rôle of an accuser; it is the intention merely to point out how prevalent is this ignorance and to show how momentous a matter in its larger aspects it really is.

It is concerning the employment of the navy in war and peace; the fundamentals of strategy; the work of the fleet, its character and amount; its organization; its various industrial activities; the reasons for its vast money expenditures, etc., where ignorance if it exists does so much harm to the navy and the country. Two

examples in the case of strategy alone will suffice to substantiate this statement. The clamor for naval protection that went up from the individual Atlantic coast ports during the Spanish-American war, which led to the creation of the flying squadron and a consequent very dangerous division of the fleet, is one. That this outcry which became so insistent that the authorities in Washington were forced to heed it was owing to ignorance of the most elemental principles of strategy and would most certainly have led to utter disaster had the Spaniards been more on the alert. The bombardment, by the Germans, of Hartlepool and other coast ports of England in the present war, is the other example. These were carried out solely and simply for the accomplishment of a certain object, by playing upon the ignorance and fears of the English public, an object which could not be attained by other means. This object was, of course, first to divide the grand fleet; the second to force the retention in England of as many troops as possible, and it must be confessed that owing to the dread of invasion engendered by the knowledge that enemy ships were frequently visiting the English coast, these bombardments, legitimate or otherwise, accomplished the desired purpose in no small degree; and yet the fear of invasion was probably the least worry of the leading naval and military men in England at that time.

There are myriads of other cases which could be cited to show that a general and universal elemental knowledge of naval matters is an absolute necessity, if the public is intelligently to support its navy in war and too in peace.

It is desirable that the character and general duties of each type of ship be known. Why it is better to have one large ship, rather than a greater number of small ones aggregating in cost a like amount; what destroyers are for; the limitations of the several types; the relative fighting value of each; the influence of geographical position on the particular value of any one type of ship for our own and other countries, etc. For instance, to digress a moment, if the general public realized how vitally important the submarine was for the security of the Panama Canal, our various island possessions and large harbors, there would not now be the popular indorsement of the idea of abolition of the submarine which exists, for they are by far the cheapest and most widely effective coast and harbor defence that we have.

Of course, it is not feasible to enumerate here all of the many cases in which the naval authorities are directly dependent upon public knowledge and opinion for efficient and correct procedure. Not only does it depend upon opinion and knowledge, but upon public good will, and therein lies not only the indication that this good will should be fostered and accurate knowledge supplied, but also a direct and certain refutation of any claim that the dissemination of knowledge concerning naval matters is militaristic propaganda of an objectional character.

That the public would be interested and would meet naval authorities half way is a foregone conclusion. The subject is in itself interesting, and even if it were cut and dried, the civilian who pays for the naval establishment certainly must take an interest in the return for the vast expenditures involved. It is astonishing that the people have not long ago demanded in some concise and concrete form information which would put the mind at ease concerning the many vital questions at stake. That the navy has not made some provision on a large scale before, might lead one to think that there was reticence about disclosing its inner workings. This is not the case. The navy is proud of its work, and it has a right to be. Above all, it does not fear criticism and publicity, but on the contrary welcomes it.

The situation to the writer is that of an industrial manager consulting a specialist regarding some work he is performing at his direction. The manager is perfectly willing to agree that the specialist knows more about the technique of the particular job in question than he does, but as to the whys and wherefores, he not only is interested to know, but is most certainly entitled to an explanation. If a specialist under the employ of a certain man realizes that his manager is not aware of the necessity for some highly technical appliance for the betterment of his plant, what is his duty? To sit tight and criticise him for his lack of technical knowledge? Certainly not. His duty is quite plain. If he is loyal to his employer he will go to him, explain the necessity and use every endeavor to obtain what he knows to be essential. The chances are that the employer is convinced. If not, then at least the specialist's duty has been done and the responsibility for the absence of the appliance is placed where it belongs. And so it becomes apparent that the public, for the most part far removed

from sea coasts and living a life that would not naturally suggest the navy to mind, should be kept informed of the whys and wherefores of the navy.

This duty must necessarily devolve upon naval officers, who are the specialists in this particular instance.

There is a point in connection with the intelligence given out which should be emphasized. It should come only from men who are known to be reliable. This is so apparent as to make this statement appear ridiculous. But what do we see on every hand, in the case of many civilians asking about service matters? Some bluejacket just discharged is asked for his opinion on the battle of Jutland, on the value of the battleship now that the submarine has developed to such an extent or on any number of questions no less momentous. The writer has writhed in agony many times while listening, unwillingly, of course, to some ignorant man or officer expounding false theories in all seriousness, thereby doing irreparable harm and impairing confidence in other officers and men of more repute.

There are many legitimate methods of disseminating knowledge relative to the navy, almost all of them cheap and requiring no cumbersome or new organization.

The best method it is thought would be widely to advertise the NAVAL INSTITUTE PROCEEDINGS, reducing the subscription price as the circulation grows, and requesting articles from civilians and suggestions for titles to articles which would bring out questions of interest to them. It is apparent that this method has great possibilities and is entirely feasible, for it was not long ago that through the agency of the Institute a prominent civilian asked for and received valuable information on the much discussed question of the relative value of one large ship as against several small ones aggregating in cost a like amount. This was accomplished by the offer of a price for the best article to appear. An excellent treatise was the outcome and so convincing as to abrogate all doubt on the subject and which fully substantiated the present policy of the General Board. The offer of a prize, of course, was quite incidental, and if request had been made the article would undoubtedly have made its appearance without it. There is no attempt here to suggest that such a procedure should be followed as a general rule. It merely serves to illustrate that

there is a large and fertile field for those in the service whose efforts are directed towards its betterment and a closer relationship with its supporters.

Some other methods which could be used to advantage are suggested, although the list given below is by no means exhaustive.

Co-operation with the Navy League along the same lines as recommended in connection with the Institute.

Co-operation with accredited members of the press.

Lecturing by accredited officers located in vicinities where particular interest is taken in any phase of naval activity.

Constituting an officer on each ship a departmental agent for the purpose of receiving press correspondents or delivering lectures and organizing display parties on board ship. In connection with this method it might be stated that it is only in this manner that a general policy in the discussion of naval affairs can be assured, and also those topics which should be reserved from enemy ears or which should not be openly talked of would be more closely guarded, by reason of the personnel charged with publicity being under direct control of the Navy Department. The higher the rank of the publicity officers, of course, the better. Another thing to be said in favor of this plan is that if the civilian knew that there were certain accredited and reliable officers detailed by the authorities for the above purpose, there would be very little of the haphazard gleaning of information often so false and harmful, which has been spoken of before.

Regarding publicity in any form there is only one danger that can be foreseen. It is to be feared that in some instances it might be resorted to in order to gain political advantage; this, however, could easily be eliminated by a direct stipulation that neither personal nor individual ship accomplishments should be the subject for advertisement. At any rate, on this particular point it is not so much a question of preventing a new evil as it is of limiting one already in existence. With one and only one person on each ship or station responsible, such matters could easily be traced to their source.

There is a host of subjects, which should be given publicity through discussion, lecturing or written articles, that pop up in the writer's mind, but as it is manifestly impossible to expatiate upon them here and as indeed this would be out of place, intima-

tion only of the type of topic the consideration of which would give a start to the whole scheme, herein outlined, will be given in the following list.

The relation of the navy to the government showing that it is a force not merely for the sake of force but for the purpose of attaining a certain object that the government must attain, after diplomacy has first been tried, but has failed.

An article explaining in plain terms and by simple examples the elements of strategy and tactics; particularly showing where these matters concern the civilian and the government and that these subjects are not dry, half dead theories, but are living and pertinent issues every day in the year.

Another setting forth the reasons for and the values of the different types of ship, laying especial stress on the value still retained by the major type of ship despite the tremendous development of the submarine. The fallacy of the small ship idea, etc.

A fourth on the navy's industrial activities, would, it is believed, be of particular interest to the civilian whom the writer has heard time and again ask for information on this subject. The points generally brought up for discussion are the reasons for the greater overhead expense in the navy operated plant, the apparent waste, etc. The difference in the end sought and the necessarily different point of view should be emphasized, the uncertainty of availability and shifting of ships due to uncontrollable circumstances, the cancelling of plans half finished due to this unforeseen shifting, etc., etc. Setting forth that the greatest efficiency experts have tried a hand at bettering conditions with but little, if any, success and pointing out that suggestions are thankfully received.

An exposition, profusely illustrated, of the work the service does with a comparison of hours of actual employment, wages, the kind of existence undergone, etc., laying particular stress on the hard and dirty work which is at the present time little known to the outside world. In articles heretofore there has been too much devoted to clean, immaculate quarter decks and long lines of bluejackets on parade, which misrepresents to a cruel extent the true nature of the navy's work. Pointing out that Saturdays and holidays when visitors are generally in navy yards and aboard ship, is no time to judge of the nature of the work that is performed normally.

It seems that a discussion of the work of the reserves, their value, their weaknesses, their peculiar position in the navy as against their status in the army, etc., would be particularly timely.

Effective articles could be written in answer to some of the questions which are so often asked as to be standard and the joke of every ward room.

What do you watch for when you go on watch?

What do you do all day?

How nice it must be to yacht on a destroyer.

There is no attempt here at the last to be facetious, nor would there be in an answer to these questions any indication of hurt feelings. That such questions are asked wholesale by the civilian is a very serious matter, and one that will not admit of trifling. It is a sure indication that the work of the service is not only not appreciated, but that it is undreamt of. The personnel of the navy, and the Lord too, know that its work is fully as exacting in physical and nervous strain as that of any other profession, either in war or in peace. The failure of the public to realize this fact has led and will continue to lead, unless some corrective measures are taken, to lack of sympathy and support.

In conclusion, it must be admitted that an exchange of ideas among the civil and military could not be held without occasional spats and ruffling of feathers on both sides. However, it would certainly be of the utmost value, alike to both, and it is by this means alone that the idea of sides now existent, can be eliminated and a new idea of co-ordination instituted which will weld all into an inseparable team. By the latter means only can we hope for that solidarity of support so essential to the efficient operation of the main stay of the nation's honor, integrity and security: *our navy*.

DISCUSSION

A Few Notes On Alternating Current

(See Page 1171, Whole No. 197)

Lieutenant Ellery W. Stone, U. S. N. R. F.—While Lieut. Commander Anderson's purpose in presenting an elementary paper on alternating current is an excellent one, several statements are made in his article which may bear criticism. They will be taken up successively below.

In Note 5, Mr. Anderson regrets the lack of text books which avoid the use of calculus in the presentation of the elements of alternating current. His attention is invited to the treatise on alternating current in Book Four of the Hawkins Electrical Series and to Part Two of Sheldon-Hausmann's "Dynamo Electric Machinery" in both of which he will find the matter presented in simple and lucid style.

On page 1173 of his article, he defines high frequency as being frequencies in excess of 100,000 cycles. From this, are we justified in assuming that a current of 50,000 cycles is of low frequency? As a matter of fact, the terms "high" and "low" can only be used relatively, and certainly may not be employed to draw a sharp and definite line of demarcation between currents of different frequencies. When quenched gap sets using 500 cycles were first introduced into this country they were often termed, and quite properly so, "high frequency" transmitters in contradistinction to the 600-cycle sets previously in use. Yet Mr. Anderson's definition would place all frequencies less than 100,000 cycles in the realm of low frequencies.

On page 1194, he correctly states that when a tone is of more than 20,000 vibrations per second it is inaudible, yet on page 1174 in his definitions of radio and audio frequencies he makes 20,000 *cycles* the upper limit of audibility. Since each cycle of alternating current produces two clicks of a telephone receiver, *i. e.*, one for each alternation, it will be seen that his second value is twice the first, for a current of 20,000 cycles will sound a pitch of 40,000 in a receiver. In radio engineering, it is customary to make 10,000 cycles—20,000 alternations—the dividing line between radio and audio frequencies.

On page 1175, the statement is made that there are two conceptions of the electro-magnetic induction of potentials but the distinction between the two is erroneously drawn. The two illustrations given are identical. There is but one requirement for the generation of electric potentials by electro-magnetic means and that is that there be relative motion between a conductor and the lines of magnetic force about it. The turns of the secondary of a transformer are cut by the expanding and collapsing lines of force due to the alternating current in its primary quite as effectively as are the armature coils of a generator by the flux of its fields. If there

are two conceptions, we should expect to find two fundamental formulæ for the generation of potentials but there is, of course, but one—applicable alike to generators and transformers.

The "sine" curves shown in Figs. 2 and 9 are not sine curves but series of straight lines joined at their extremities by curves. A table of natural sines will show that a straight line variation of the sines of angles of widely different sizes does not obtain.

In the first paragraph on page 1190, the statement is made that reactance depends upon the frequency of the current, for it increases with the rate of change of current. This should be qualified to show that it is inductive reactance to which the author alludes, for condensive reactance decreases in value for increase in frequency. Further on in the same paragraph, Mr. Anderson states that "as the rotor gets up to speed and the frequency becomes less, more currents are sent through the low resistance winding." This would seem to indicate that two resistance windings are supplied, one of low and one of high resistance, whereas, as stated in the beginning of the paragraph, but one resistance winding is supplied. "Impedance" should be substituted for "resistance" in this sentence. To be correct, this paragraph should be written as follows:

"The double squirrel cage has two windings that parallel each other but are not connected. One is high resistance, the other is high inductance. The reactance, and hence impedance, of an inductance depends upon the frequency of the current, for it increases with the rate of change of current. Therefore at starting, the frequency being the greatest, there will be a maximum impedance of the inductive winding with the result that most of the currrent will flow through the resistance coil due to its lower impedance. As the rotor gets up to speed and the frequency becomes less, the decreasing reactance of the inductance will cause its impedance to become very much less than that of the resistance winding, so that practically all of the current will flow through the inductance. In this type of rotor, then, the insertion of starting resistance is automatic."

In Fig. 11, the customary resistance in series with the arc and generator has been omitted. If connected as shown, the generator would be practically short circuited by the arc, as the resistance of the blow-out magnets, which are wound with heavy copper wire, is not great enough to sufficiently limit the arc current. This resistance is often called the "ballast," which term Mr. Anderson appears to have applied to the ground.

In the first paragraph on page 1195, the statement is made that each wave train as it comes in gives one impulse. If this be true, it is not clear why the current must be *rectified* in order to make one click of the telephone diaphragm from one impulse of incoming signal current. Actually, the frequency of the incoming current is inaudible and is determined by its wave length. This holds true whether the waves be damped or undamped. The wave train is rectified in order to charge a condenser with recurring direct current impulses at radio frequency, just as alternating current must be rectified in order to charge a storage battery. The summation of these unidirectional charges is discharged once per wave train into the telephone receivers, but it should be noted that the change

from radio to audio frequency occurs after rectification—not before. The number of discharges of the condenser per wave train is unity, the number of charges per wave train is equal to the number of waves in the train which depends on the damping or logarithmic decrement, while the *rate* of charge of the condenser depends on the frequency.

If the same method of reception were applied to undamped as to damped waves, we should have one click of the telephone receiver for each depression of the transmitter key since one wave train is radiated for each dot and dash sent. Accordingly, as stated by Mr. Anderson, beat reception is necessary for receiving undamped waves.

Trajectories and Their Corrections

(SEE PAGE 1375, WHOLE NO. 198)

COMMANDER E. F. EGGERT.—In this article the author refers so frequently to my article on a similar subject, making comparisons between the method described therein and one by Professor Moulton, that he imputes to my article a purpose quite foreign to it. It seems therefore fair that I should endeavor to place my article in its proper relation to ballistics.

It happened that the Board of Control followed my article by a special statement, generally to the effect that during the war it had been obliged to publish practically any material received, however worthless. I should regret it very much if my article could not rise above that mediocre plane, but perhaps that is where it belongs; nevertheless, when general condemnations are being passed around, one always hopes that perhaps after all the other fellow was meant.

Since the present article draws in my method as a proving-ground method, it is only just to me to show how the method came to originate, and what its purpose was. Had time and opportunity permitted, no doubt the method could have been developed for proving ground use also, but such was not its original purpose.

A few years ago, being interested in inclined armor protection, I obtained a copy of the Bureau of Ordnance range table for the 16″/45 gun intended for the *Maryland*, the first type to mount guns to give 30° elevation. To determine still greater ranges than this table contained, I plotted and endeavored to exterpolate the results, only to find that the curve was very flat at the end, an evidently impossible result. The range table was wrong, and the information therefore of no use to me for design purposes.

I had done no ballistic work since my Naval Academy days, and did not know whether the methods then taught were still in use. I obtained therefore a copy of Alger's latest work for the Academy, and found that the 16-inch range table was indeed made by the old Alger method.

What I wanted to know was whether the 16-inch gun was really much superior to the 14-inch gun at a given long range, what the approximate difference in range, for a given elevation was, and what were the final velocities and angles of fall; it was only such general questions I wanted answered, and not questions of difference in range due to a variation from standard conditions.

Being fairly familiar with mechanical integration, from study in other directions, I began to apply it to this subject, since the difficulty in integration was the chief trouble with the Alger method. It took considerable time to get far enough to use it, since the subject was nothing more than a means of amusement in my idle hours, and, moreover, one stationed here is fairly out of the world, and thrown entirely on his own resources. The new method gradually came to a working basis, however. Then many months elapsed before I had computed, and often recomputed, enough trajectories to answer my immediate purpose. I was then so struck by the great amount of the correction necessary in the Alger method, that I determined to publish the results, more to indicate the possibilities of mechanical integration, and to call attention to the great errors in the old method, than to claim finality of precision.

My own method having now been put in its proper place, it might be permissible to say a few things in criticism of the other method, even though it was developed by a professional astronomer, of long experience, and with a large staff, unlimited time, and great experimental facilities available.

To begin with, the Moulton method is distinct from the Bliss sequel, and the former accomplishes only the same thing that my own does. It is in fact identical with it in most details. The chief difference is in the use of second differences, which I neglect. The effect of these is, however, easily determined by a short subsequent correction, if needed, but for most purposes the difference can be neglected.

That I used Mayevski's equations in my article has no bearing on the method. It was the latest information the navy had at the time my article was prepared. Whether the present accepted resistance results are more precise has yet to be proved, but at any rate the difference is not very much.

To revert to the example shown by Lieut. Commander Kirk, which is the same trajectory as given in my article, I have recomputed this, using the new resistance tables, with the following results:

Method	Range
Siacci	20,000
Eggert, original	19,931
Moulton	19,910
Eggert, new tables	19,949

These are all uncorrected for ΔR, and it appears that the difference in the range, due to the difference in the tables, is 18 yards.

Lieut. Commander Kirk has neglected to correct his range for variation in the amount of g. The actual mean value of g in this trajectory is 32.151, but he has used a uniform value of 32.185. The difference accounts for a variation of range of 18 yards, to be added to his value, making it 19,928 yards.

Correction for second differences shows that in this case the range is increased by less than a yard. The remaining difference between the ranges, as given by the two methods, is then 21 yards, and it is due to accidental errors of calculation, probably caused by small differences in the tables.

The author, on page 1384, states that with so large a ballistic coefficient, and at so short a range, there would not be much variation between the two methods. We have usually to deal with such large coefficients, but, when we calculate trajectories for small-arms projectiles, then, as I had already stated, a shorter interval than one second may be necessary. As regards the short range, it need only be said that, for one-second interval, the second difference correction is but eight yards at 37,000 yards' range.

Comparing the two methods, it can easily be maintained that the Moulton method is by far the more cumbersome. It would be conservative to say that it takes twice as long as the other. The apparent precision is hardly worth while, since we all know that, after making all possible corrections, we still have a mean dispersion in range, on actual firing, of from 40 to 80 yards, and we know also that actual measurements of ranges, when made by different methods, vary by 10 to 20 yards. The small integration error is swallowed up in this much larger error in firing, and of course the actual error of any one round may be much larger.

Now as regards the Bliss sequel to the Moulton method. This is a calculation to obtain differential equations, to correct the trajectory, and for proving-ground purposes something of the kind is desirable. As stated by the author, however, the calculation is as long as that of the original trajectory, and as it is of an entirely different character, and requires a new form, it is an awkward complication.

Most of the variables can be corrected, as I have indicated in my article, by a simple equation of the form, $s = \frac{1}{2}\alpha t^2$, where s is the correction in X or Y, due to a change α in the given variable, for the time of flight t. This correction can be determined in a minute, with a slide rule. In this way there would be handled changes in diameter or weight of projectile, in coefficient of form, in density of air, in gravity, or in resistance of air, the mean change in these cases being used.

Changes in range, due to variation in angle of elevation, are readily handled, as in the oldest method, on the principle of the rigidity of the trajectory.

Except for wind effect, this leaves only change in initial velocity to consider. There is no way of correcting for this, by my method, except by recalculation of the trajectory, with a new velocity. To do this, however, requires only one recalculation, and the two calculations will take not more than as much time as is required by the Moulton method for the original trajectory, besides being a check on each other, and a new form, with its distinct method, is avoided.

Coming to wind effect, although the Bliss method includes a correction for wind, the correctness of the principles involved is in my opinion much in doubt, and the results are open to question. We are still far from knowing the effect of the wind, and we still have much to learn by experiment. Much of what has been assumed the effect of wind is undoubtedly drift, and until we can make projectiles that are and remain dynamically balanced on their axes, and that rotate in exactly the same way, we cannot hope to solve satisfactorily the question of either wind or drift, which are closely related.

To return to the question of time required in my method, it should be noted that in the last paragraph of the body of my article I referred to the use of an interval of two seconds for ordinary large-caliber trajectories. This is really the best interval, and, for the 20,000-yard trajectory illustrated, takes up but half the space shown, and half the time. It can be corrected, just as for a one-second interval, for integration error, so as to give the same precision, and thus is both easy and accurate.

The correction referred to, for second differences, is carried out as indicated below. Taking as example the first integration, that of r_h, it appears that we have neglected to subtract in each case one-twelfth the second difference. The last value of V_h should therefore have *added* to it one-twelfth the summation of all the second differences in the r_h column, multiplied by the interval, in this case unity. This summation is nothing but the arithmetical difference between the first and last first differences in this column. In the example in my article, the first of these first differences in 4.1, and the last is .2. The difference 3.9, divided by 12, or .3, should be added to the last value of V_h. The effect of this error in V_h on X, is found by multiplying by half the time of flight, since half the error can be taken as the mean error in the velocity, and the resulting correction in X is +4.8 feet.

The correction of the integration in the V_h column is effected in the same way. The first of the first differences is 63.4, and the last is 23.0. One-twelfth the difference is 3.3, which is the effect on X, and must be subtracted. The total of these two corrections is +1.5 feet.

In the same way the effect on Y is determined. We find the mean error in V_v, from their r_v column, and the integration error of the V_v column. The first is +.05, causing an error of 1.6 feet in Y, and the second is —1.8, or a net reduction of the last value of Y or .2 foot. This is multiplied by cotan. ω to get the corresponding error in X, which is —.6 foot.

We find therefore that the error in X is composed of an error of +1.5 feet due to the X integration, and of an error of —.6 foot due to the Y integration, or a final correcion in X of +.9 foot. It should be noted that the variations in velocity are not great enough to cause secondary corrections in r.

When the interval is two seconds, the method is similar, proper use being made of the interval.

In discussing precision of calculation, the precision of measurement must be a guide, and there is no use in carrying precision farther in calculation than in measurement. Since the error of measurement is greater than these errors of integration, for a one-second interval, with ordinary large projectiles, there is not much gained by applying the correction. There is besides some uncertainty in the basic tables, and it is well known that the coefficient of form is not a constant.

Since receiving the new tables of air resistance and air density, I have changed that part of my method which requires curves of these values, and have computed convenient tables of these values. All this material is arranged on the two adjoining pages of a notebook, for values of r from zero to the resistance at 6000 foot-seconds, and for values of the

density to a height much beyond my present requirements. These tables accelerate the work considerably. Their place, in the Moulton method, is taken by tables covering 12 pages, to give a precision that is entirely useless. This will indicate how cumbersome the method is.

Opposition to Sane Sport in American Colleges

(SEE PAGE 1369, WHOLE NO. 198)

LIEUT. COMMANDER K. C. MCINTOSH (S. C.), U. S. Navy.—Mr. Frank Angell opens his argument with the following: "My point is that this grinding drill takes out of a sport its essential element, which is the enjoyment of the player. . . ."

There is no sport of any kind which has come under my notice in which anything approaching success may be attained without "grinding drill" of a more or less monotonous character. There is certainly no sport which has a greater individual element therein than golf, and no sport which gives the player greater freedom to stop when he is tired or disgusted or out of temper. Golf is not learned by playing matches, and of all the unenjoyable performances in the world, standing at a tee and driving one ball after another for a caddie to chase and bring back, swinging hour after hour in the hope of eliminating that exasperating slice, is about the most disheartening. Any modern game from beginning to end is *work*. Its value to the individual is not in the enjoyment or fun he gets out of every minute spent on it, but in the discipline, mental and physical and psychological.

My football experience began while the "flying wedge" was still the accepted method of putting the ball in play, and continued with few breaks until the first year of the forward pass. The bulk of it was done in the "guards back" and "tackles back" days. During this period my weight gradually increased from 110 pounds to a triumphant 135. Many and many a night during football season have I wept into my pillow from sheer discouragement and the pain of my bruises; many and many a day my knees have knocked together as I trotted out of the gym, thinking of the many times I was about to run in to take the place of my drawn-back tackle and in some desperate manner hold two men in their places till the half-back was clear, each man weighing from 50 to 80 pounds more than I. The pleasure I derived from it then was non-existent. But aside from the fact, brought out by Commander Taylor, that the rigid training of those eight years has left me under the necessity of careful exercise to avoid gout and muscle-binding, there is nothing in my entire school and college course which has been of so much use to me. I do not mean that the plaudits of the multitude ever paid me for my trouble, for if anybody ever called for a "long yell with three Mc's on it" I was too busy or too stunned to hear it. But in that grinding drill and hard punishment, I got a pretty fair grounding in the first necessity of success in any line—perseverance and subordination.

I agree heartily with Mr. Angell's stand against commercialism, but I do not agree with him in his belief that varsity teams and big games are

undesirable. They are the best that a college has to offer in the way of general training for making one's way in the world, and Commander Taylor's objection to overtraining is being slowly recognized and met by a system of college physicians whose business is to see that no boy is driven to the danger point.

"Big games" are good for the college and good for the boys. They must remain unless we want to go backward. The answer apparent to my mind is to have athletics endowed in the same manner as Greek or Biology, and an intercollegiate agreement on a maximum salary for coaches.

Mr. Angell repeats the fallacy of the "premium on weight as against dexterity." Weight has been and continues at a premium because of the absence of dexterity. There are many big men in the aristocracy of football, but they all got there by dexterity. But where is the big man whose game outshines that of Frank Hinkey (133 pounds), McBride of Yale (145), Johnny Hart (130), Arthur Poe (148), or Daly in his Harvard days? The University of Minnesota once put out a mammoth team, the "little man" of which—who is now Commander Hancock, S. C., by the way—weighed 185 pounds. Herschberger of Chicago and Pat O'dea of Michigan had no great difficulty in piloting lighter teams through them. Eckersall, Ristine, "Biscuit" Howard, Bullock, "Cracky" Dague—does anyone know any big men who could outshine them at any stage of the game?

It is to be regretted that more colleges have not followed the lead of Amherst and provided large fields for scrub games of all sorts, with room for five or six games going on at once. It is still more regrettable that more colleges do not follow the Naval Academy system of making each student pick at least one sport and go in for it to a prescribed minimum. But do not damn the big game. Without it, there would be no minor games with any educational value and very little to be gained physically which could not just as well be gained with the exciting dumbbells or the thrilling Indian clubs. The training in keeping one's temper, in merging one's entire strength into the team, in the suppression of self-seeking and loyality to the college—which is the beginning of loyalty to the firm or the navy or to America—the psychology of playing till you drop because the Idea needs you no matter how battered you are—all these depend on the big game. Not necessarily on making the varsity and playing in it, but in driving oneself to unsuspected limits in trying to make good enough to get there, and in heartily cheering your head off for the fellow who got your place away from you by superior playing.

Baseball players call it "heart"; bluejackets call it "guts," generals and admirals call it "morale," but we've got to have it; and very few boys ever wore padded moleskin without finding it. Nobody ever made a varsity team who did not have it. A game that does not call for considerable sacrifice of comfort or pleasure may build up a few muscles, but will do nothing towards making men.

U. S. NAVAL INSTITUTE

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Notice Whole Nos. 6, 7, 10, 13, 14, 15, 17, 145, 146, 147, 149, 155 and 179 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., SEPTEMBER 15, 1919.

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PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER WALLACE L. LIND, U. S. Navy

GENERAL ARRANGEMENT

VESSELS BUILDING.
NAVAL POLICY.
MATÉRIEL.
PERSONNEL.
OPERATIONS.
MERCHANT MARINE.

France 1769
Germany 1771
Great Britain 1773
Japan 1780
United States 1781

NAVIGATION AND RADIO 1794
ORDNANCE AND GUNNERY 1798
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FRANCE

REBUILDING FRANCE'S MERCHANT MARINE.—On August 5 the French Cabinet authorized M. L. Klotz, the Minister of Finance, to introduce a bill in the Chamber of Deputies granting 1,830,000,000 francs for the reconstruction of the French Merchant Marine.—*Scientific American*, 8/16.

THE FRENCH NAVY.—It is recognized in France, as in this country, that the present is a time of watchful waiting, in the phrase of President Wilson. With the German Navy gone, there is a wholly fresh outlook, and it would be foolish, to say the least, to resume at once the building of ships which would probably be out of date before completion. The Paris *Temps* laments the lack by France of a navy corresponding to her policy, and says: "It is necessary that in the present circumstances we should take note of our naval decline. Can we accept it and make no attempt to regain our former rank amongst the navies of the world?" There can be but one answer to this question, yet the voice of caution should not be disregarded in the eagerness of our Allies to raise the efficiency of their marine. What all the Allies have to do now is to determine how far and in what manner the events of war have influenced warship design. French naval construction has not always proceeded along the best lines. Sometimes it has been swayed by the idea of numbers of small craft, in the belief that the right policy was the *guerre de course;* at other times France has launched out into big ship programs which materialized slowly. To-day, she has 12 fine modern battleships, but they are outclassed by those completed for Great Britain during the war. Fortunately, France only lost one modern battleship, the *Danton*, during hostilities, whereas Great Britain lost two dreadnought battleships and three battle cruisers. We also lost eleven older battleships compared with three lost by France. No doubt the Ministry of Marine, in preparation for new ships which it may desire to build later, will overhaul its system of construction and the equipment of its yards and manufactories with a view to expediting output.—*Army and Navy Gazette*, 8/16.

A GREAT FRENCH SHIPBUILDING SCHEME.—A far-reaching scheme for the development of the French merchant marine in general, not only by the construction of a number of new vessels in the native shipyards, but also by the purchase of ships from Allied nations, has been prepared by the responsible Ministers, and a bill to authorize an expenditure of £78,000,000 for the purpose is on the point of being submitted to the legislative chambers for consideration. Apparently this proposed outlay, the approval of which is looked upon as a foregone conclusion, does not include the making of any provision either for incidental, though absolutely essential, projects, such as the extensions of port works and equipment for the rapid discharge of steamers up to 12,000 tons, or for the scarcely less important expansion of the sorting stations or sidings at the ports, in order to be able rapidly to deal with the great increase in traffic which it is confidently expected will be experienced in the course of the next few years. Prior to the war the total French tonnage of passenger and freight steamers combined represented 2,400,000. Of that total, 900,000 tons were lost during the course of hostilities. Even with the pre-war tonnage, however, it was only possible for one-fourth of the aggregate imports and exports to be shipped, the balance of three-fourths being transported in vessels belonging to other nations. The question of developing the merchant marine has been under consideration for some time past, and it has now been possible to prepare a scheme which M. Claveille, Minister of Public Works, states will result in the creation of a total fleet of 5,000,000 gross tons in a definite period of three years from the present time. Before deciding on the new scheme, an examination was made of the situation of affairs in the middle of July. It was found, for instance, that the gross tonnage of vessels acquired, constructed or ordered by the state on the basis of credits previously granted was 509,000. On the other hand, private shipowners have accomplished better results, better indeed than had been expected as a fresh beginning since the conclusion of hostilities, and an official tribute has been paid to the great efforts which they have put forth in this direction. Thus, the orders definitely placed by private enterprise in France and other countries comprise ships of a total of 1,015,000 tons gross, of which 491,000 tons represent passenger steamers and combined passenger and freight ships, and 524,000 tons consist of cargo vessels and other kinds. It will therefore be seen that the vessels ordered by the state and private shipowners reach a combined total of 1,524,000 tons.

It is, however, quite evident that an additional new tonnage of 1,524,000 is totally inadequate for a country which aspires to transport in national ships the whole of its outward and inward foreign trade, and even when supplemented by those of the pre-war fleet of merchant steamers which still remain, and many of which, be it said, should really be replaced by modern vessels, the number would be still insufficient if the national object is to be successfully achieved. Under these circumstances, the French authorities decided, in the first place, to take a census of the productive capacity of the native shipyards, for although it may be good policy to purchase ships from Allied countries, it is realized that it is better to keep the French yards and their workmen occupied. As a result of the census, the government proposes under the bill to allocate orders to the national yards for their entire production for a period of three years, "if the prices are reasonable." It is impossible to understand from recent speeches of the Minister of Public Works the amount of the tonnage which will be represented by these orders. But M. Clémentel, Minister of Commerce, was more precise on a recent occasion when he mentioned that the Minister of Public Works had already given orders to the national yards for vessels of a total of 1,000,000 gross tons. The Minister added that in these cases the prices to be paid by the builders for coal and ship plates had been guaranteed to be equal to English prices, so that the vessels would be constructed substantially at the same cost per ton for raw materials as British-built ships. It was explained that this concession would place upon

the shipowners the obligation to charge freight rates identical with those of British shipowners. As the prices for coal and shipbuilding materials have been guaranteed, the natural assumption is that, if the actual purchase prices are higher than those paid by British shipbuilders for the same kind of materials during the corresponding period, the amount of the difference will be defrayed by the government and the contribution will represent what is practically a subsidy on shipbuilding. On the other hand, and in the absence of any information on this particular point, it may be concluded that the ships ordered by private enterprise and representing 1,015,000 tons, or at least the percentage of them contracted for in native yards, do not carry a guarantee as to the prices which the builders will have to pay for coal and other materials.

It was, of course, known in government circles that the productive capacity of the French shipyards would be insufficient fully to cope with the program of 5,000,000 gross tons within a period of three years. As a consequence, the responsible Ministers some months ago approached the governments of the United States and Great Britain for assistance in the supply of ships. In this connection, the Minister of Commerce, replying recently to an interpellation on the economic policy of the government, stated that the 500,000 gross tons of ships arising from the agreement which he had signed with the British Government had now been allotted to the French. It is not quite clear whether these ships have been sold or transferred for a time, but an unofficial statement is to the effect that they have been lent. The Minister of Commerce also mentioned that important purchases were on the point of being concluded in the United States. Since then, M. A. Tardieu, General War Commissioner for Franco-American transactions, has given details of those acquisitions with which he has been associated. It appears from this information that the ships already delivered and those yet to be supplied by the United States will total 1,000,000 tons gross, of which 75 per cent will be steel steamers and only 25 per cent wooden vessels. In addition, there has to be taken into consideration the share of the German tonnage of merchant vessels to be assigned to France under the terms of the Treaty of Peace, so that the big program seems in a fair way of realization, at all events on paper. The French state under the circumstances promises to become a large merchant shipowner in the course of the next few years. No light on the problem of the working of the state steamers has apparently been thrown by recent Ministerial speeches, but the inference to be drawn from the speech delivered by the Minister of Commerce, as previously mentioned, is that the ships of 1,000,000 tons ordered by the state from private yards are to be transferred to shipping companies. Moreover, a French newspaper statement, which is attributed to an authority who is competent to judge the question, is to the effect that the steamers being built for state account are to be handed over to companies in which the state, so to speak, will become a shareholder for the amount of the state's contribution in ships to each company. If this really represents the proposed policy as regards the contemplated new fleet, considerably more than half the aggregate tonnage of 5,000,000 will be under government control. It remains to be seen whether this policy will prove to be sound. At any rate, without state intervention in the acquisition of ships, it would be impossible for the French nation to make the strenuous effort to become independent of the merchant fleets of other countries which is in contemplation.—*The Engineer*, 8/22.

GERMANY

GERMANY ADMITS FOUR MILLION TON SHIPPING LOSS.—While numerous figures have been published estimating Germany's mercantile shipping losses during the war, the first comparative statement of losses coming from Germany direct appeared recently in the *Berliner Tageszeitung*. This gives the following figures:

"As is well known, we owned on January 1, 1913, a fleet of 4850 ships of every size, with a gross register tonnage of 4,935,909 tons. We now have 3649 ships below 1000 tons, with a total of 589,263 gross register tons, and of ships above 1000 tons 106 ships with a total of 135,673 gross register tons. Altogether, therefore, Germany has 3755 ships with 724,936 gross register tons.

"The net result is a loss of more than 4,000,000 gross register tons, that is, more than four-fifths of our whole tonnage, which leaves us not quite enough to conduct our Baltic shipping with our own cargo space." —*Scientific American*, 8/16.

CONCLUSION OF THE BUILDING CONTRACTS FOR THE RECONSTRUCTION OF THE GERMAN MERCANTILE MARINE.—The negotiations between the Government, the ship-owning concerns, and shipbuilding yards with regard to the contracts for the reconstruction of the German mercantile marine have now been concluded, so that, looking at things from that point of view, there is now no impediment in the way of the constructions being energetically taken in hand in the yards at once. The basis upon which the costs of construction are being calculated is, briefly, the following: The shipbuilding yards are to build the ships under government control, and in so doing are to charge the factory (Selbstkosten) cost for the material and wages and to add to it so much per cent for working expenses, and then to reckon a percentage of profit upon the total amount. The following is the manner in which these costs are to be divided between the shipbuilding yards and the Realm. Taking the standard price for the gross registered tonnage as the basis, the prices for ships valid on August 1, 1914 and those valid on October 1, 1918, have been calculated. The Realm will assume the responsibility for the extra cost of ships as compared with October, 1918, whilst the difference between the prices obtaining on August 1, 1914, and those valid on October 1, 1918, will be borne by the ship-owning concerns and the Realm in equal proportions. For purposes of comparison it is interesting to note that the prices of October, 1918 amounted to about 2.8 times as much as the values of August 1, 1914, whereas the present value is 2.5 times as much as that obtaining on October 1, 1918—thus seven times as much as on August 1st, 1914. Therefore a ship that cost about 2,000,000 marks in 1914, could have been built for 5,600,000 marks in 1918, but now costs 14,000,000 marks. The contribution to be paid by the Realm therefore reaches a stately amount, but there is hope that it will be possible to reduce this burden for the taxpayer by means of a gradual reduction of the wages.

The settled situation resulting from the above agreements has resulted in an abundance of orders being given to the yards, but that gain is counterbalanced by the fact that the prospects for the delivery of shipbuilding steel are unfortunately practically hopeless. The orders given in December will probably be executed in August; at the present moment it is not possible to get orders accepted at all. Therefore in so far as the yards have not still some material at their disposal they will scarcely be able to complete any further constructions this year. This is all the more regrettable because in view of the present value of German money, orders from abroad could have been reckoned upon in spite of the enormous prices, as is proved by the negotiations between Scandinavian shipowning concerns and German yards, and that again would have been more advantageous, for technical reasons connected with the rate of exchange, than the exportation of unworked rolled steel which is now apparently necessary to pay for the foodstuffs imported.—*Hansa*, 5/3.

THE INTERNATIONALIZATION OF GERMAN RIVERS.—The peace terms proposed by the Entente demand the internationalization of all the large rivers which would still remain to Germany, in particular the internationalization, for the benefit of the Czechs, of the Elbe and the Oder. The Rhine has

been internationalized, in a way, for more than a century, and the system has given good results. There was an international Rhine Navigation Commission, which had to act as the supreme authority over the river and as court of appeal, and which regulated the development of the Rhine on a uniform system. Formerly England was represented on that commission in addition to the riparian states. In principle the flags of all nations were treated alike on the Rhine. Now, of course, endeavors are being made to give France the predominant influence on the Rhine, but it will scarcely be possible to make any change in the system of equal rights for all on the Rhine because Holland's influence upon and power over the Rhine navigation are too great. In the case of the Elbe a similar internationalization might well be agreed to, for the formation of which, by the way, the first steps had already been taken, should consist exclusively of representatives of the riparian states. On the other hand the Oder, being a purely German stream, cannot be taken into consideration straight away for internationalization. But we in Germany are in favor of a similar internationalization of the Vistula. But that is just the river for which the Entente does not provide internationalization, for the Vistula is to be placed under the sovereignty of the Entente state, Poland. And this brings us to the gist of the whole matter. All the German rivers are to be withdrawn from German sovereignty in order that the interests of all nations may be safeguarded. That is a sound principle, as in truth world-commerce and the freedom of trade and traffic must be considered first and foremost. But that would entail the internationalization of the Rhone, in order to secure to Switzerland an outlet to Marseilles; and it would be even more necessary to internationalize the Vistula and the Scheldt, and, above all, the Danube. But it has already been decided to leave the Vistula and the Scheldt out of the question. The Rhone is not mentioned at all in the peace terms, and difficulties are already arising with regard to the Danube. I see from a report in a Belgian paper that pettifogging little countries like Serbia and Roumania are opposing the internationalization of the Danube because they do not wish to abandon their own sovereign rights. Serbia and Roumania propose only that the League of Nations should be given supervisory mandate. Germany has, of course, no objection to a general internationalization of the great rivers, but it must unconditionally oppose the establishment of exceptional laws for the German rivers alone. Germany must demand that the same principles shall apply to all great rivers, thus, in particular to the Danube, Rhone, Scheldt, Po, Tagus, and the great rivers of Russia.—*Hansa, 6/21.*

GREAT BRITAIN

NEW BRITISH SHIPS.—The British Navy has long been the most powerful in the world, and the part it played for the Allies in holding the seas was a powerful factor in winning the war against Germany. When the war began, the British fleet displaced almost twice as much water as the German fleet, and this would have seemed sufficient to assure predominance. But the British Admiralty at once set on foot plans for additional ships, and the work of building was carried on with great secrecy but with remarkable efficiency and celerity. When the armistice put an end to hostilities 2,000,000 tons of warships had been added to the roster of the British fleet, and there were on the stocks, in addition, vessels aggregating almost another half million tons, including four mammoth battle cruisers, twenty-one light cruisers, over a hundred light cruisers, and eighty submarines. It was decided not to proceed with work on those of the ships that had only recently been begun, but, even with these omitted, it was found that the war and the ingenuity that it had elicited had found expression in a number of remarkable types of vessels, which in any new conflict would make the British Navy more powerful than ever.

The recent assemblage of Sir Roger Keyes's fleet at Southend, England, has enabled the British public to see some of the new types of ships built while the war was in progress. One of the developments of the war is what is known as the "Flying Squadron," consisting of four remarkable ships under the orders of Captain W. S. Nicholson. This officer's flagship is the *Furious*. This ship is officially described as a "light cruiser," but she displaces almost as much water as the battleship *Neptune*. She was designed as a fighting ship, with thin armor protection, a speed of thirty-two knots, and an armament of two 18-inch guns. Early in the spring of 1917 the fleet urgently needed fast airplane carriers, and it was therefore decided to adapt the *Furious* to this purpose, eliminating the heavy guns. A large hangar was built on the forecastle deck, and above this construction, which can accommodate about ten airplanes, a flying-off platform, 160 feet long, was made. The removal of the after 18-inch gun turret enabled a flying-on deck, no less than 300 feet long, to be provided. Of all the ships in the fleet, the *Furious*, with her strange erections, is probably the most notable. Though she is 786 feet long, as compared with 409 feet in the case of the original dreadnought, she draws only 21½ feet of water. The flying squadron includes three other seaplane-carrying ships—the *Argus*, *Vindex*, and *Vindictive*. The British Navy is the first to possess a squadron of this character to act as the eyes and ears of the heavy ships, performing, as there is reason to expect, scouting work more efficiently than it has ever been done by the fastest cruisers.

Remarkable progress was made during the war in the design and construction of under-water vessels. When hostilities opened, the submarine was a little vessel of slow speed, which usually crept about with a mother ship in attendance to render aid in case of accidents. The British fleet has now been provided with submarines which are submersible cruisers in all but name. The K-boats would have filled Jules Verne with delight. They are 338 feet long, with a beam of 26½ feet, and have a surface speed of no less than twenty-four knots—in other words, they can travel more swiftly than the cruiser *Powerful*, which twenty years ago was the swiftest vessel in the British fleet; while under water their electric motors drive them at nine knots. Each is armed with a 4-inch gun, besides a 3-inch anti-aircraft weapon, and possesses eight torpedo tubes. These submarines are of quite original design. Besides the steam turbine for going full speed on the surface and the electric drive for use when submerged, they are provided with a Diesel engine, which is employed just before diving or immediately after breaking the surface on rising after traveling under water, in order to shorten both these operations and enable the submarines to evade attack by more heavily armed surface craft.—*Mid-Week Pictorial*, 8/28.

HALTS WARSHIP PROGRAM.—All private shipbuilding yards throughout the country, numbering about twenty, are affected by the government order that all work be stopped on warships except those about to be launched.

The Admiralty yards at Chatham, Devonport, and Portsmouth will not stop, however, as they are entirely occupied with the refitting of 2700 steamers which are about to be returned to the owners, from whom they were requisitioned for war service. Among the warships being built at private yards are cruisers, destroyers, and submarines, and the work on some of these may be continued, according to *The Mail*, if it is found cheaper to complete them than to break them up.

Shipbuilders must be liberally compensated in cases where contracts are broken, but, although several million pounds sterling may be involved, it may prove more economical than carrying out the building program.

The Mail quotes an officer of the Admiralty as saying that one sound reason for stopping work on warships is that the step will clear the yards for commercial building. There is an excellent demand for new tonnage, and this work probably will absorb the men liberated by the stoppage of

work on naval vessels. According to *The Glasgow Daily Record*, work on forty warships, valued at £25,000,000, has been stopped.—*N. Y. Times*, 8/28.

RELATIVE NAVAL STRENGTH.—With the question of economy very much to the forefront of our national politics people are naturally curious to know what the prospects are of immediate reductions in our naval and military expenditure. So far as that on the sea services is concerned, the war has left legacies which it will take some months yet to discharge, and to judge by the daily press there is less impatience manifested with Admiralty administration in this connection, and rightly so than with that of some other departments.

Looking to the future, however, much must depend upon the standard of strength to be adopted by the government as that at which our naval forces must be maintained. For many years before 1909 our preparations were based upon a formula which had the great advantage of being simple and easily understood by the people. It was that the British Fleet should be equal to the fleets of the two next strongest naval powers. Only when Germany embarked on an extensive building program which was manifestly directed chiefly against this country did the two-power standard cease to be applicable, because it became inadequate. As Mr. Churchill admitted in the first speech he made on the Navy Estimates after his appointment to the Admiralty, "on the facts of to-day the navy we should require to secure us against the most probable adverse combination would not be very much greater than the navy we should require to secure us against the next strongest naval power," but he went on to explain why the time had come for us to readjust our standard in closer accord with actual facts and probable contingencies. "The actual standard of new construction," he said, "which the Admiralty has in fact followed during recent years has been to develop a 60 per cent superiority in vessels of the 'dreadnought' type over the German Navy on the basis of the existing Fleet Law." When the war came it was found that the Grand fleet in the North Sea was, in the principal types, less than 60 per cent superior to the High Sea fleet. It had 20 dreadnoughts against 13, and four battle-cruisers against three, but from 1915 onwards, with the reduction of our oversea commitments in modern armored ships, the relative strength of the fleet at Scapa gradually improved. At Jutland, Jellicoe took into action 28 dreadnought battleships against the enemy's 16, and Beatty had nine battle-cruisers against the German five, but there were also six pre-dreadnought battleships in the enemy fleet. In numbers, therefore, we were slightly over the 60 per cent margin, but not up to the higher standard of "two keels to one" which had been urged on the Admiralty from several quarters.

What the future measure of our strength is to be remains, no doubt, undecided for the present. It may serve to throw light on the situation, however, if a comparison is drawn between the numbers of ships in the principal classes in the British Navy to-day and the numbers in similar classes in the fleets of the two next strongest powers. Such a comparison may be made in perfect good faith and in no invidious spirit, since it happens that at the moment the powers concerned are our friends, the United States and Japan. The following table is based largely on the information contained in the new edition of Lord Brassey's *Naval Annual*:

	Great Britain	United States	Japan	U.S. & Japan
Battleships (dreadnoughts)	33	18	7	25
Battleships, building	—	6	2	8
Battle-cruisers	9	—	4	4
Battle-cruisers, building	1	6	—	6
Light cruisers	60	3	8	11
Light cruisers, building	12	10	—	10
Destroyers, built and building	390	326 ?	89 ?	415
Submarines, built and building	150 ?	122 ?	26 ?	148

From the above figures it will be seen that the British Navy's 33 dreadnought battleships exactly equal the total, built and building, of the two next strongest powers. The six building for the United States include the *Massachusetts*, of 43,200 tons, for which Mr. Daniels announced on August 1 that the contract had been placed with the Fore River Company. As regards battle-cruisers, Britain has nine, including two 15-inch, three 13.5-inch, and four 12-inch ships, as compared with the four *Kongos* in the Japanese fleet, which mount 14-inch guns. The six projected U. S. battle-cruisers were stopped in March last, until the results of Mr. Daniels' visit to Europe were known, so that if proceeded with they cannot be effective for some time yet. Meantime the *Hood* will be completed for our navy this year.

There is an overwhelming preponderance in British light cruisers. The 60 shown in the table excludes all launched before 1909—the *Scout* class, the *Gems*, and the *Boadiceas* with earlier types—and the building total of 12 is made up of four of the *Elizabethan* class and eight *D* cruisers. On the other hand, the 11 vessels in the American and Japanese navies are all that they have in the way of light cruisers. It is true that, looking backward for a moment, these powers have each 12 armored cruisers, including three for Japan, which mount four 12-inch guns, whereas the full total of British armored cruisers is 19. The armored cruisers belong to an obsolete type, however, useful in many ways, but totally unsuited to be put into the line of battle against more modern ships, as was proved not only by what happened to the squadrons of Cradock and Arbuthnot at Coronel and Jutland, but also, on the other hand, to that of von Spee at the Falklands. Destroyer totals are necessarily fluctuating at the present time, with several units of the war programs uncompleted, and a wholesale scrapping policy in progress. The British figures omit 97 vessels from classes *A* to *F*, but the maximum totals are given for the United States and Japan, although it is not known how many boats may be building for these powers, nor how many either is scrapping. It may safely be said, however, that the British destroyers certainly equal those of the other two nations in numbers, and are nowise inferior in power and battle-worthiness, having nearly all been built during the war. Roughly, too, it may be said that our submarines equal in number those of Japan and the United States combined. We began the war with 76 boats of all classes, and it is officially stated that our losses were 59. Those not lost, moreover, are scrapped by this time. During the war, however, Messrs. Vickers alone produced 54 British submarines, and it is known that at least two other firms, besides the public dockyards, were engaged in submarine construction. Even if the 148 boats of all classes in the United States and Japanese navies, from those launched in 1901 onwards, are taken into consideration, we have probably as many vessels, which on an average should be, of course, of greater size and power.

From this summary examination of the relative strength of the three navies, the fact emerges that we have certainly a two-power standard at present, and no very heroic measures are necessary to maintain it. To repair semi-obsolete ships must be absolute waste. In fact, unless some of the other members of the League of Nations decide to launch out into warship building programs, we ought to be able to effect large economies in material strength with complete safety and security, and also without resorting to expedients which would bear hardly on the personnel which has done so much in the war.—*The Army and Navy Gazette*, 8/23.

THE CHANGING POLICY OF GREAT BRITAIN.—In this country events rather than theory or calculation determine the national policy to a greater extent than in any other state. That is why its leading principles are seldom understood by the masses. Otherwise adverse criticism of the Budget would not have fastened on Imperial Preference as if it were a new factor, which was optional in our fiscal policy, but would have seen it in truer per-

spective as a symbol that Britain's position in the world has been changed by the war. She is no longer a creditor but a debtor nation, or, as Mr. Chamberlain put it, foreign exchanges which were once all in our favor are now partly in our favor and partly heavily against us. The money market of the world is, at any rate for the present, no longer in London, but in New York, and a more dangerous rival than even Germany is already contesting our supremacy at sea. The initiation of Imperial Preference, which was steadily resisted in this country for fifty years, is not a concession to the Dominions in recognition of their military aid during the war, but the first step in the commercial policy which is in process of being forced upon us by our changed circumstances.

Now as foreign affairs and armaments are intimately related, the modification in our economic policy is bound to be followed by a change in our military policy. Except indirectly, the politicians have, so far, failed to indicate its leading principles, the "no conscription" pledge at the last general election having had no reference to present realities. In the city Admiral Beatty emphasized the necessity for the maintenance of our seapower, and Sir Douglas Haig for the creation of a Citizen Army, as the prophets did, in vain, before the war. But, in the circumstances, they could not indicate what the army and navy for which they call are in the future to guarantee. That is the duty of Ministers. It is, however, obvious that the principles which have guided successive governments since 1890 must be revised. They then appeared for the first time in a memorandum, which was not published until ten years later, and was drawn up by Mr. Stanhope, Minister of War in the second Salisbury Administration. This action was due to the demand of the Duke of Cambridge from the politicians for an intelligible military policy with a view to preparation for war. Although in the fifties the idea that free trade would end war was dominant, by 1869 the illusion was so far dispelled that the two-power standard for the navy was officially adopted by the government of that day. But the function of the army had become so indefinite that the War Office did not know what it was for, at any rate apart from policing the Empire.

In the Stanhope Memorandum it was laid down that, as Great Britain was never likely to be engaged in a European conflict, a small expeditionary force was all that she required, the underlying conception being that she was to remain a neutral state in perpetuity guaranteed by her navy. This marked her severance with the national policy in defence which had guided her for centuries, to correspond with her severance with the national policy in finance, commerce and shipping accomplished in the sixties. As the new departure bore no relation to the facts of international existence, the rise of foreign navies, especially one, forced us to recall our naval legions from the frontier, and later on to abandon the two-power standard. Hence our frantic efforts to secure our permanent neutrality (1) by "entangling alliances," (2) bartering our naval rights for "scraps of paper" at the Hague, (3) buying German "goodwill" by valuable concessions. As the war, which proved the impossibility of maintaining a cosmopolitan commercial policy with national armaments, drew nearer, the incoherencies of our military policy increased; for instance, the creation of the territorials on a voluntary basis, recognition that the expeditionary force might be employed on the continent, and the naval and military understandings with France and Belgium. Nevertheless, the fallacies underlying the Stanhope Memorandum were, practically, reaffirmed in its restatement as the Nicholson Memorandum of 1910, and the bankruptcy of our policy was completely revealed by the great war into which we were precipitated unprepared.

By her support of the League of Nations at the Peace Conference Britain attempted to provide the international basis for her trade and commerce which she failed to secure at the Hague Conference. But, up to the present, the results as regards armaments are negative, while the positive results are a more plentiful crop of ill-will as between states, together with nearer

prospect of numerous wars to come, than was ever produced under the old conception of things mundane. For this reason the doctrine of the balance of power has not been shelved, as Mr. Lloyd George and Mr. Wilson hoped, but is perpetuated in the conventions by which Great Britain and the United States undertake to go to the help of France should the German legions ever cross the Rhine again. But the danger of future conflict is now presenting itself, not in the West, but in the East.

Under these conditions the question of her military policy is for Britain a pressing one. The idea that she can preserve her neutrality in perpetuity has been shattered by the war and by the rise of the American Navy, which renders it doubtful that she can maintain her predominance at sea. Moreover, the progress of events since 1914 has convinced her that British finance and commerce cannot be cosmopolitan, and British industries national, without danger to her security. In spite of herself she has had to modify her fiscal policy during the war, and the armistice budget proves that the process is to be continued. It is, therefore, necessary for us to adopt a new conception of the function not only of the army but of the navy. Fortunately signs are promising that it is being worked out in the true British way, not by theory but by the pressure of events.

For long enough we defied as far as we dared the principle that "defence is better than opulence." Now that the price is paid in the passing of our opulence, we are retracing our steps. Cosmopolitanism is being abandoned wherever it impairs security, and so our fiscal policy is taking shape on national and, as the budget bears witness, on Imperial lines. To correspond with this development Lord Jellicoe is on a mission to the dominions in order that the naval defence of the Empire may be co-ordinated, not with a view to centralization but to decentralization. That the burden of maintaining British sea-power was growing too heavy for the people of these islands was plain before the war, it is plainer now. The dominions and India must contribute according to their power, and as they are willing to do. In no other way can the Empire survive in the new era of competition that is upon us. Hitherto the barrier to the full expression of this policy has been the lack of a common governing principle in Imperial trade. As Britain has now come into line with the dominions, the only sound foundation for an Imperial naval policy is being laid, and Canada, South Africa and India will follow the example set by Australasia in the creation of naval divisions of the navy as strong as their circumstances permit. The Five Nations, four of which are growing rapidly, and India between them ought in time to be able to maintain British sea power against all comers.

With regard to the army no definiteness in policy has yet appeared, and cannot as long as present conditions on the Rhine continue. An Imperial army we must have as we must have an Imperial navy. But we are further away from the recognition of a common principle for the foundation in the one than we are for the foundation in the other. For neither in Britain nor in Canada has universal service been adopted. All that we know for certain is that the old conception of the function of the expeditionary force is obsolete. We must devise a new military policy to correspond with our new economic policy, as we are already doing with regard to a new naval policy.—*Army and Navy Gazette*, 7/19.

NEW RATES OF PAY FOR BRITISH NAVAL OFFICERS.—America is in the habit of believing it pays for professional service the highest rates in the world. Perhaps this is true in the professional engagements of civil life. But in the National Service it is easy of proof that the United States is frugal indeed, and in comparison with Great Britain must take a seat far removed from eminence when the pay of navy officers is under scrutiny. Just at this time it is expedient to consider a few facts. We have before us an official table of rates of base pay in the British Navy which shows in the percentages of increase in post-war over pre-war pay in that service in

grades corresponding to those in the U. S. Navy, advances of from 185.7 per cent for midshipmen down to 31.9 per cent for junior lieutenants, or an average for the eleven grades of 79.3 per cent. The table follows:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rank (Line officers only)	Pre-war pay	Temporary raise for war	War pay temporary	Permanent raise over pre-war pay	Permanent post-war pay	Per cent. of raise of post-war over pre-war pay	Total allowances received in addition to post-war pay	Maximum permanent post-war pay [(5)+(7)]
Admiral of the Fleet	$10,643.40			$3,547.80	$14,191.20	33.3%	$11,973.83	$26,165.03
Admiral	8,869.50			3,547.80	12,417.30	40%	11,973.83	24,391.13
Vice Admiral	7,095.60			3,547.80	10,643.40	50%	11,973.83	22,617.23
Rear Admiral	5,321.70			3,547.80	8,869.50	66.6%	11,973,83	20,842.33
Captain (on promotion)	1,995.54	$2,085.33	$4,080.87	1,240.83	5,321.70	166%	1,054.35	6,376.05
Commander (on promotion)	1,951.29	2,039.99	3,991.28	1,790.91	3,742.20	92%	543.48	4,285.68
Lt.-Comdr. (on promotion)	1,153.04	1,414.46	2,567.50	1,021.81	2,174.85	88.6%	354.78	2,529.63
Lieutenant (on promotion)	975.65	1,153.04	2,128.69	532.17	1,507.82	54.5%	354.68	1,862.60
Sub-Lieutenant (on promotion)	665.21			212.02	877.23	31.9%	177.39	1,054.62
Midshipman	155.22	443.48	598.70	288.26	443.48	185.7%		443.48

—*Army and Navy Journal*, 9/13.

ROYAL AIR FORCE.—It has been decided that officer personnel of the Royal Air Force will be provided for the present: (1) By awarding a limited number of permanent commissions. (2) By granting 2500 temporary commissions.

The King has assumed the title of Chief of the Royal Air Force. His Majesty has approved of new titles for the commissioned ranks of the Royal Air Force. These are set out below with their corresponding ranks in the army and the navy:

Air Force	Navy	Army
Marshal of the Air	Admiral of the Fleet	Field Marshal
Air Chief-Marshal	Admiral	General
Air Marshal	Vice-Admiral	Lieut.-General
Air Vice-Marshal	Rear-Admiral	Major-General
Air Commodore	Commodore	Brig.-General
Group Captain	Captain	Colonel
Wing Commander	Commander	Lieut.-Colonel
Squadron Leader	Lieut.-Commander	Major
Flight Lieutenant	Lieutenant	Captain
Flying Officer (or Observer)	Sub-Lieutenant	Lieutenant
Pilot Officer	Midshipman	2d Lieutenant

The object which has been held in view is to preserve and emphasize the principle of the independence and integrity of the Royal Air Force as a separate service among the fighting services of the Crown.

The scheme is framed on the principle (*a*) that the ranks should as far as possible correspond to actual functions, (*b*) that the ranks should as

far as possible correspond to equivalent status in the three services, and (*c*) that there should be no repetitions in titles apart from the prefixes in the higher ranks. A distinction is preserved between the regimental officers and officers of general rank. Officers of general rank in the Royal Air Force are "Air Officers," and the expression "Air Officer" corresponds to the expression "General Officer" in the army or "Flag Officer" in the navy.

The new titles came into force on August 4.—*The Army and Navy Gazette*, 8/9.

THE BALTIC SUCCESS.—An important and dramatic success was achieved by the British naval forces in the Baltic against the Bolsheviks on Monday. The merit of the achievement is heightened because it was unparalleled by anything accomplished by our navy in the war with the Central Powers, whose vessels, kept almost entirely behind forts and minefields, gave no opportunity for such a feat. There may be some people who wonder why we should now be attacking the big ships of a power with whom we are not officially at war. But, as was explained in Parliament after the action of May 31, also in the Finland Gulf, the British Admiral opened fire on the Bolsheviks "because they opened fire on us." Those into whose hands the Russian ships had fallen were playing the part of pirates, pure and simple, and no peaceful traders or fishing craft were secure from their molestations. In such circumstances the British Navy was fulfilling its traditional rôle in an endeavor to restore order, and the brilliant operation of Monday should go far towards the attainment of this aim.—*The Army and Navy Gazette*, 8/23.

TO MAINTAIN BRITISH MERCANTILE SEA POWER.—After a very impartial and reasonable survey of the situation a well-informed correspondent of the *Observer* concludes that our position at sea is not lost, only threatened, and it will be our own fault if we do not make up our leeway. Whereas before the war we owned nearly one-half of the world's merchant shipping and America one-twentieth, now we own just over one-third and the United States just under one-fourth. Unless the leeway of over 5,000,000 tons of British shipping, which should be at sea and is not, can be made up speedily, the U-boats will have achieved one of their aims at least, that of displacing Britain as the chief maritime power. The consequences of such a defeat have perhaps been scarcely weighed by our countrymen. If we do not hold the mastery in our hands we shall be at the mercy of those who have it, and once dependent on foreign ships we should be almost as much a beleaguered citadel as in the deadliest days of the U-boat war. "We shall be," says the writer in the *Observer*, "defenceless before the operations of trusts of all kinds unless we retain the power to merchant our goods where we will and fetch what we require whence we please." By the needs of the Empire, no less than in justice to the memory of those who gave their lives to save us, the government must surely embrace the opportunity offered to make our mercantile marine more a truly national and Imperial service than it has been even in the most palmy days of our past.—*The Army and Navy Gazette*, 8/16.

JAPAN

AVIATION SCHOOL AT KURE NAVAL STATION.—The Japanese Navy will establish an aviation school at Kure at an estimated expenditure of yen 260,000. This amount will be added to next year's (1920) budget. Hiromura, Kamo district, Kure, was inspected yesterday by the future president of the school, Rear Admiral Yoshida.

An aeroplane machine shop has been built at Hiromura which is said to be the site of the future naval aviation field.—*Yorozo*, a Japanese newspaper, 7/15.

THE GREAT EXPANSION OF KURE ARSENAL.—Our Navy Department does not expect to realize the scheme of 8:8 squadron organization at present, owing to our government's united industrial resources. For this reason naval authorities have made provision in the Budget for the purpose of expanding our industrial resources on both the water and land. This is necessary in order to accomplish the decided plan during the succeeding four years commencing during the year 1920. Also it has been decided not to give any future warship construction orders to foreign countries. By utilizing properly our private factories in Japan orders from our navy will cause the development of gun factories and also the government factory at Kure Naval Arsenal, commencing during 1920. There are also plans on foot to manufacture armor and heavy gun forgings.—*Osaka Mainichi*, a Japanese newspaper, 7/8.

UNITED STATES

BIG SUBMARINE LAUNCHED.—The fleet submarine *AA-2*, the latest word in undersea boat construction in this country, was launched to-day.

The *AA-2*, built at the Fore River yards of the Bethlehem Steel Corporation from the designs of the Electric Boat Company, is said to be the fastest Diesel-engined boat afloat. Her surface speed will exceed 18 knots an hour and she can run at 13 knots submerged, according to the designers. She was designed to operate with the battle fleets and has a cruising radius estimated at 7000 miles. The *AA-2* is approximately 300 feet long.—*N. Y. Times*, 9/7.

NINETEEN SHIPS BUILT IN ONE MONTH.—During the month of July, 1919, the Bethlehem Shipbuilding Corporation established a world's record for ship deliveries by completing and delivering ten 35-knot torpedo-boat destroyers and two large submarines for the U. S. Navy, five large tank steamers and two ocean-going tugs for the Emergency Fleet Corporation. In the same months the 35 other American shipyards delivered only 67 vessels, including destroyers and submarines. The largest number of vessels delivered during the same period by any other corporation was eight ships, while from all the other yards building naval vessels, only three destroyers and one submarine were delivered. Since all the engines, boilers and deck machinery required for these 19 vessels were built by the Bethlehem Corporation, as well as the complete hulls, some idea of the magnitude of this accomplishment can be gained, especially when it is realized that for the destroyers alone Curtis turbine engines totaling over a quarter of a million shaft horsepower were constructed, and also the Yarrow type water tube boilers necessary to generate this vast volume of steam. To supply shipyards with the steady flow of material necessary for the accomplishment of such rapid construction was in itself a record, as over 78,000 tons of material were used, requiring over 1500 freight cars, which would make a freight train over 18 miles long. If all of the 19 ships were anchored end to end in the Hudson River, they would make a parade over one mile long, or from 110th Street to 130th Street. The scientific construction of torpedo-boat destroyers has been so efficiently developed by the Bethlehem Shipbuilding Corporation, that a destroyer has been completely built and delivered to the government in 174 working days from the laying of the keel. This same type of vessel took approximately one and a half years to build before the war.—*Army and Navy Journal*, 8/23.

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED AUGUST 31, 1919

Type, number and name	Contractor	Per cent of completion			
		Sept. 1, 1919		Aug. 1, 1919	
		Total	On ship	Total	On ship
Battleships					
43 Tennessee	New York Navy Yard	85.2	80.7	82.1	77.6
44 California	Mare Island Navy Yard	72.2	64.2	68.4	60.3
45 Colorado	New York S. B. Co.	30.1	10.3	28.4	7.4
46 Maryland	Newport News S. B. & D. D. Co.	53.	44.5	51.3	42.2
47 Washington	New York S. B. Co.	29.5	9.6	28.	6.8
48 West Virginia	Newport News S. B. & D. D. Co.	25.1	2.2	24.2	2.2
49 South Dakota	New York Navy Yard	0.	0.	0.	0.
50 Indiana	New York Navy Yard	0.	0.	0.	0.
51 Montana	Mare Island Navy Yard	0.	0.	0.	0.
52 North Carolina	Norfolk Navy Yard	0.	0.	0.	0.
53 Iowa	Newport News S. B. & D. D. Co.	0.	0.	0.	0.
54 Massachusetts	Fore River S. B. Co.	0.	0.	0.	0.
Battle Cruisers					
1 Lexington	Fore River S. B. Co.	Plans being revised			
2 Constellation	Newport News S. B. & D. D. Co.	Plans being revised			
3 Saratoga	New York S. B. Co.	Plans being revised			
4 Ranger	Newport News S. B. & D. D. Co.	Plans being revised			
5 Constitution	Phila. Navy Yard	Plans being revised			
6 United States	Phila. Navy Yard	Plans being revised			
Scout Cruisers					
4	Todd D. D. & Const. Co.	30.7	9.1	29.7	7.8
5	Todd D. D. & Const. Co.	28.2	7.1	27.3	6.
6	Todd D. D. & Const. Co.	23.3	1.6	22.1	1.3
7	Beth. S. B. Co. (Fore River)	0.	0.	0.	0.
8	Beth. S. B. Co. (Fore River)	0.	0.	0.	0.
9	Wm. Cramp & Sons Co.	15.	....	14.	....
10	Wm. Cramp & Sons Co.	15.	....	14.	....
11	Wm. Cramp & Sons Co.	4.	....	3.	....
12	Wm. Cramp & Sons Co.	4.	....	3.	....
13	Wm. Cramp & Sons Co.	4.	....	3.	....
Miscellaneous					
Fuel Ship No. 16, Brazos	Boston Navy Yard	98.6	98.5	98.5	98.4
Fuel Ship No. 17, Neches	Boston Navy Yard	30.	19.	26.	14.
Fuel Ship No. 18, Pecos	Boston Navy Yard	6.2	.2	.2	.2
Gunboat No. 21, Asheville	Charleston Navy Yard	94.7	89.7	90.8	85.5
Gunboat No. 22, Asheville	Charleston Navy Yard	6.5	5.	5.	4.
Hospital Ship No. 1, Relief	Phila. Navy Yard	46.8	41.4	43.3	36.9
Amm. Ship No. 1, Pyro	Puget Sound Navy Yard	95.	90.	93.	88.
Amm. Ship No. 2, Nitro	Puget Sound Navy Yard	63.	48.	57.	41.
Rep. Ship No. 1, Medusa	Puget Sound Navy Yard	0.	0.	0.	0.
Destroyer Tender No. 3, Dobbin	Phila. Navy Yard	0.	0.	0.	0.

There are 148 destroyers, 60 submarines, 7 mine sweepers, 18 sea-going tugs, 16 harbor tugs, 12 oil tankers and 31 Ford eagles in various stages of completion.

There were completed and delivered to the Navy Department during the month of August 6 destroyers, 2 submarines, 3 harbor tugs and 6 Ford eagles.

There are in addition 12 destroyers and 10 submarines authorized but not under construction or contract. Miscellaneous vessels authorized but not under construction or contract (3): 1 submarine tender No. 3, 1 destroyer tender No. 4, and 1 transport No. 2.

NAVAL POLICY

THE ARGUMENT FOR THE SUBMARINE.—In our previous issue we presented the argument against the future construction of submarines, which is based mainly upon its frightful potentiality as a means of piracy against merchant shipping, and to a less extent upon its hitherto supposed tactical inefficiency when employed in legitimate operations against enemy warships.

Our suggestion that, because of the German misuse of it, the submarine should be outlawed has brought forth so many protests from naval officers, and, strange to say, particularly from those of the British service, that we have made a fresh study of the subject, based upon hitherto unrevealed facts of the war, and as a result we confess to a considerable modification of our attitude, particularly as to the military efficiency of the submarine.

Thus, an officer of our own service who has specialized in submarine work writes us: "I think you do a great injustice to the British submarine service, for they have done truly remarkable work. It may interest you to know that the losses in the British submarine service were relatively greater than the losses in any other branch of any service engaged in the World War. Some day the truth will be told and the British submarine will gain the crown it so justly deserves."

The efficiency (legitimate military efficiency) of the German submarines during the four years of war has been revealed by one of the Allied Service magazines, which states that they accounted for more warships than any other agency. Omitting the warships lost by being wrecked, by collisions, and by accidental explosions, submarines accounted for nearly one-third of the total losses, the mine coming next with one-fifth to its credit. Since the mines, after the first few months of the war, must have been laid by mine-laying submarines, the Allies having command of the surface of the sea, it is reasonable to credit the submarine with one-half of the Allied loss in warships.

So much for its tactical success. As to its strategical effects, they are so well known as to require no elaboration. One does not read very far in Jellicoe's book without realizing how greatly the submarine influenced, if indeed it did no dominate, the strategy of the North Sea and the great blockade. In the early days of the war the British seem to have attempted a close blockade of the enemy coasts; but the sinking of the *Cressy*, *Aboukir* and *Hogue* by a single submarine in a single attack changed the strategy overnight, and thenceforth the close blockade was abandoned. Later, it is true, the British submarine took over the work in a modified degree; but the attempt to shut the German fleets in their harbors by maintaining a superior force of surface ships off the German coasts was abandoned. Thereafter the lines of the British blockade were removed to the northern and southern exits from the North Sea, and the blockade lines were drawn from the Orkney Islands to Norway and from Dover to Calais. It is evident, then, that the work of the submarine service as now being revealed, has raised this type of fighting ship until it takes rank as one of the main elements in the make-up of a well-found fleet.

Naturally the abolition of the submarine would be to the great advantage of the power or powers which control the surface of the sea, or possess the largest merchant marine. Great Britain and the United States are the leading powers, both in the strength of their navies and size of their merchant fleets; so that it is very significant that the strongest arguments for retaining the submarine have come from these sources. These arguments are based, of course, upon its military value.

An admiral of our navy who spent the period of the war in Europe and was intimately associated with the naval operations, draws our attention to the demonstrated efficiency of the submarine as a scout, particularly as developed during the operations of the war. This type of vessel, he affirms, is the only one with which it is possible to establish a scouting line which cannot be chased away by more powerful vessels. "You hardly

realize how much this means until you have been engaged in a good many chart meneuvers, or aerial maneuvers on the sea, and seen your scouting line of relatively light cruisers ripped up and rendered ineffective by the battle-cruisers of the enemy." But no line of battle-cruisers, however strong, would serve to scatter or break through a screen of submarines; and if they should attempt to drive through, seeking information of the enemy forces, they would do so at the greatest peril of loss or serious disablement.

Talk to any officer of this special service and he will tell you that the submarine is the one vessel that can cut loose from its base and cruise for months upon the high seas in absolute independence. Hence it is the ideal vessel for observation and blockade. In speed it has gone up to 24 knots (as in the case of the British K-boats) and in size to 2500 tons. In the present state of the art it is possible, on a displacement of 1800 tons, to build a submarine of 18 to 20 knots maximum surface speed, that can stay at sea continuously for three months and cover 10,000 miles at cruising speed. The maximum speed submerged would be 12 to 13 knots for one to one and a half hours, and at 5 knots submerged the radius would be about 220 miles.

These then are the proved military capabilities of the submarine, as determined or suggested by the experiences of the late war, and in all fairness it must be admitted that as a military unit, it has come into its own. Had it not been for the German abuse of the weapon, its abolition would never have been suggested; but, as one party to the present controversy remarked: "What legitimate weapon of war did they not abuse?"

That the cause for abolishing the submarine on humanitarian grounds is strong cannot be gainsaid; but that the interdict could be carried out is doubtful, because of the vast system of oversight that would be required—to say nothing of the irritation resulting from the wholesale espionage that would be necessary.—*Scientific American*, 9/6.

ARMY AND NAVY AIR CO-ORDINATION.—The claim by advocates of a Department of Aeronautics scheme, that the Joint Army and Navy Board on Aeronautics is inefficient because it is without either authority or power to act on questions of co-ordination of Army and Navy Air Services, would appear to be refuted by the work of the board during the last two weeks. Meeting three times a week, this board has taken up practically every question that might be expected to arise concerning the functions and duties of the respective services. Moreover, every matter that has come under consideration by the board has found army officers and navy officers practically in agreement as to the proper solution of the problem involved. The questions discussed have involved production, training, and operation, covering the entire field of aeronautics. Among the results already attained are some which certain Senators and Representatives in the present Congress have said could not be attained without the creation of a separate Department of Aeronautics.

It has been practically agreed that under certain circumstances the army is to undertake the training of navy and marine corps fliers; and on the other hand, that the navy is to train army fliers when their training with naval flying craft is necessary or desirable. This would go a long way toward solving the present difficulty with regard to the spotting of Coast Artillery fire several miles from shore. The training of army observers in seaplanes would eliminate the dangers always present if they were to be sent out for this kind of work in land planes. Similarly, it would be possible under such an arrangement for the army to take over the training of marine corps aviators in their land work, which constitutes a good deal of their training. Problems of production have also been worked out successfully. It has been determined that whenever practicable the two services are to keep each other informed on all matters of production, and whenever the same types of equipment are to be purchased,

orders will be combined in a manner that will permit of taking advantage of the market. This solution is an answer to much of the criticism generally raised against continuing the separate air services in army, navy and marine corps.

Ample indication of the authority which the board has, and the weight of its recommendations and studies is given in the fact that the Secretaries of War and of the Navy have appointed the directors of the Army and Navy Air Services as members of the board and have given them instructions to consider every matter that might properly come up in the coordination of the two services. The interest which is taken in the working of the board by Secretary Baker and Secretary Daniels is apparent in the fact that a meeting of the Joint Army and Navy Board on Aeronautics was held in the office of the Secretary of War with the Secretary of the Navy present. At that meeting the precept for the board laid down by both secretaries was that there should be no duplication of effort in the two services. The army and navy officers of the board are now working along those lines, and with such blanket authority results are forthcoming which may, they declare, vindicate the present system of control of the combat air forces by the two great military branches in the army and the navy. The Crowell report of the aeronautical situation in the Allied countries, recommending unification of air control, has not been considered by the board, nor has any other concrete suggestion for the amalgamation of the services. Indications at Army Air Service headquarters, however, are that before the matter comes up for final decision by Congress action along this line may be taken.—*Army and Navy Journal*, 8/23.

NAVY OFFICERS MAY TRAIN IN FLYING.—The Navy Department has authorized officers to make flights in aircraft receiving instructions in flying when such flights do not interfere with their regular duties or with operations of an air station or aviation detachment. When an officer is considered sufficiently skilled to safely maneuver aircraft he may at the discretion of the commanding officer of an air station or aviation detachment be permitted to engage in solo flying. No extra compensation will be granted for such flight duty. It is thought such knowledge of aviation will increase an officer's usefulness to the naval service, and therefore any injury incurred while making such flights will be considered as in line of duty.—*Army and Navy Journal*, 8/30.

MATÉRIEL

$18,000,000 ASKED FOR SHIP REPAIRS.—With the approval of President Wilson, Acting Secretary of the Navy Roosevelt recently sent to Secretary Glass for transmission to Congress estimates for additional naval appropriations totalling $18,000,000 to "permit of expeditiously placing and maintaining in a proper state of repair all of the fighting ships of the fleet."—*The Naval Monthly*, September, 1919.

LIQUIDATION OF NAVY WAR CONTRACTS.—The Navy Department has been very much alive in the liquidation of war contracts, as shown by data compiled by the Bureau of Supplies and Accounts. Upon the signing of the armistice immediate steps were taken to effect the greatest saving possible in connection with purchases in their initial stages and contracts already in effect. It was possible to cancel or withhold awards of purchases in progress prior to actual signing of contracts therefor to the amount of $27,420,427. Of contracts already in effect it has been possible to cancel all or parts of 858 contracts amounting to a saving of $24,163,866 without any liability or cost to the navy on account of such cancellation. In no case has the navy paid anticipated or unearned profits, only such profit being allowed as has actually been earned on the proportionate part of the contract completed. In nearly all cases the adjustments offered by the navy have been acceptable to contractors, the attitude of whom in only asking

a fair and equitable settlement being particularly commendable. In only a very few cases is it expected that resort to the courts will be had by contractors.—*Army and Navy Journal*, 6/9.

OFFICIAL OPENING OF NAVY DRY DOCK AT PEARL HARBOR TAKES PLACE.—The official opening of the navy drydock at Pearl Harbor, near Honolulu, Hawaii, late in August marked the successful completion of one of the most difficult engineering projects ever undertaken by the United States Government. The immense dock represents a total investment of more than $5,000,000 and has been under construction for ten years.

The dock is completed just in time to add a much needed facility for care of the ships of the Pacific fleet. The first vessel to enter the dock will probably be one of the dreadnoughts of Admiral Rodman's force, possibly the *New Mexico*. The dock is 1001 feet in length, 32½ feet deep, 114 feet wide at the bottom and 138 feet wide at the top. It will dock the largest ship of war now afloat or contemplated.

After the sections of the dock had been finished and were being anchored in their places in 1913 the water was pumped out, whereupon the bottom of the dock was forced upward by pressure from the sides, and the engineers and workmen were forced to stand helplessly by and watch the fruits of four years of labor and millions of dollars of money crushed in a shapeless mass of debris.

A new plan of construction on a much greater scale was then adopted. Concrete sections 60 feet long and the full width of the dock were cast one at a time and lowered to the bottom of the drydock, securely anchoring it. Then the great structure was built. Early in March this year the dock was pumped out for the first time. The upward pressure of the bottom had been overcome and the structure rose but three-sixteenths of an inch when perfectly dry.—*The Naval Monthly*, September, 1919.

OUR SUBMARINE WINS U-BOAT TEST.—Acting Secretary of the Navy Roosevelt made comparisons to-day between German and American submarines.

"New and interesting light is thrown on the efficiency of the German submarines by recent tests conducted by officers in the Bureau of Construction and Repair," said Mr. Roosevelt's statement.

"An opportunity recently developed in this country which permitted a direct comparison between a late design of German submarine and a late design of American submarine. While details of the comparative tests cannot be given, sufficient information is available to destroy the much-advertised superiority of the German submarine.

"As is well known, five German submarines of the latest design were brought to the United States for use in the Victory Loan campaign. Four of these boats came over under their own power, manned by officers and men of the United States Navy. The propulsive machinery of the fifth was partly destroyed or removed, so that it was necessary to tow this vessel across.

"The best of these vessels was 'tuned' for special trials. When reported ready for these trials, a special Trial Board was designated to conduct the trials, following the established practice in carrying out contract trials for submarines for the United States Navy. The boats compared were ex-German submarine *U-111*, built at the Germania Yard, Kiel, Germany (completed in 1918), and *S-3*, a submarine designed by the Navy Department; *S-3* was built at the Portsmouth Navy Yard and was commissioned in 1918.

"These boats both belong to the '800-ton class'—*U-111* having a surface displacement of 830 tons and *S-3* a surface displacement of 854 tons.

DIMENSIONS

	U-111	*S-3*
Length	235 feet	231 feet
Beam	21 feet	21.5 feet
Draft	12.5 feet	12.5 feet

"In the trials the maximum surface speed of the *U-111* was 13.8 knots, while the *S-3* made 14.7 knots. The submerged speed of *U-111* was 7.8 knots, while *S-3* made 12.4—a remarkable difference in favor of *S-3*. The radius of action of the two boats is also in favor of *S-3*, despite all the furore that was created by the advent of the U-boats on the American coast during the war.

"*U-111* can cruise 8500 miles at 8 knots, while *S-3* can cover 10,000 miles at 11 knots. The submerged cruising radius shows an equal preponderance in favor of *S-3*. Both boats can carry twelve torpedoes. *U-111* mounts two 4-inch guns, one forward and one aft, while *S-3* mounts one 4-inch forward, this practice of one gun on a submarine being standard practice in the United States Navy.

"So much for the ordinary military characteristics of the vessels. It is necessary really to live in these vessels to appreciate the radical difference in their habitability, a vital military characteristic, for a submarine is no better than its crew.

"*U-111* is congested to the last degree; she is complicated in the extreme by the installation of many 'gadgets,' some of which are of doubtful utility and more doubtful necessity. Accessibility to her equipment is very difficult; frequently it is necessary to take down three installations to overhaul one.

"On the contrary, *S-3* is a habitable, livable proposition, comparatively 'roomy,' with reasonable accommodation for officers and crew. Her equipment is accessible and her general habitability is vastly superior to *U-111*.

"Much has been written of the seaworthiness of the German submarine. An opportunity to compare the seagoing capabilities of the two vessels occurred during these trials, and the general consensus of opinion among the officers conducting the test is that *S-3* is the more seaworthy vessel. Her decks are drier, her bridge less subject to green seas, and her general behavior in a seaway superior. Referring to the comparative diving capabilities of the two vessels and general handling, there are few differences, and these few appear to favor the *S-3*.

"In the reports of the outcome of the comparative tests, the Bureau of Officers points out that there should be no idea that 'we have nothing to learn from the Germans.' There are a number of interesting details in design, construction, and operation that are well worth while studying. A few features are worthy of adoption, for the *U-111* is the 'mittel U-boat,' which type is considered by the Germans as by far their best submarine."—*N. Y. Times*, 9/7.

PERSONNEL

MR. ROOSEVELT ASKS RELIEF FOR NAVY.—Acting Secretary of the Navy Roosevelt on Sept. 10 sent identical letters to Chairman Butler and Chairman Page of the House and Senate Committees on Naval Affairs, requesting relief for the officers and men of the U. S. Navy. Mr. Roosevelt does not go so far as to suggest the form such legislation should take, but urgently requests consideration of the necessities in the present situation. Mr. Roosevelt has been closely studying the question of navy pay and the conclusions he reached are expressed in the letter mentioned above, which reads:

"As you know, the question of increased pay for the officers and men of the navy has been of serious importance for some time. Two facts are, I think, indisputable. The first is that as compared with citizens carrying on work of a similar character in private life, *i. e.*, work which requires a simi-

lar amount of training, education and performance of duty, the civilians receive far higher salaries than the officers and men of the naval service. The second is that the existing cost of living has made it not only a hardship but well nigh an impossibility for the great majority of these men to remain in the naval service.

"The present pay of the navy really goes back to 1899, though a hardly noticeable increase was made in a few cases in 1908. I do not, however, believe that new legislation should be passed giving increases which would be based on the increase in the cost of living during the past few years. I think that all of us hope and believe that the present cost of living will be materially reduced in the near future. Nevertheless, some action is required. I think that few of us hope for a reduction in the cost of living to the figures of, let us say, 1914, quite aside from the reduction to the figures of 1908 or of 1899. The fact is perfectly clear that we face an existing situation and that we ought to do something to remedy it at the earliest possible moment.

"The case of the officers and men of the navy is not to be compared with the case of other government employees who have had increases, small or large, since 1914. The navy has not had increases at all unless one excepts the war pay of the enlisted men, which was increased from $15 to $30 a month. That increase, while it may be considered from one point of view as an increase of 100 per cent is because of the smallness of the original pay almost negligible. In the case of the officers no increase whatsoever has been made, and it is a well-known fact in every navy yard that dozens of first-class mechanics have been getting more pay than the officers in charge of the shops.

"Instead of presenting a definite bill to the naval committees of Congress, I believe that time and effort would be saved if the Committee on Naval Affairs of the House and Senate could appoint a sub-committee to investigate the subject in close co-operation with a committee representing the officers and men of the navy. Furthermore, it seems obvious that any measure giving an increase of pay to one service would be of interest to the other service also, and I think that in all fairness there should be close co-operation with the army and with the Committee on Military Affairs. I am putting this forward merely as a suggestion which may appeal to you, and if you prefer some other method I shall be only too glad to help. It may seem best to Congress to pass legislation in the nature of a temporary relief, but whether the legislation takes that form or is of a more permanent character I should like to make the point that I believe something should be done at as early a date as possible. I know your sympathetic interest in this subject, and I can assure you I will be glad to co-operate in every way possible."—*Army and Navy Journal*, 9/13.

AID TO MIDSHIPMEN PROPOSED.—There is a movement on foot to request Congress to consider extending the principle of the allowance which is made to men enlisting in the U. S. Navy to the midshipmen entering the U. S. Naval Academy. Enlisted men receive an allowance of $100 for clothing and equipment, but candidates who pass the examination for the Naval Academy are required to deposit $290 for clothing and $60 for books, a total of $350. The amount is not refunded, but is expended for clothing and text-books, which become the property of the midshipmen. Listed in "clothing" are such incidentals as blankets, bed sheets, bath towels, wash basin and pitcher, pillow cases, bed spreads, spatter cloths, hair pillow, hair mattress, waste basket, etc. There has grown up a feeling that the Naval Academy equipment should supply these furnishings to the midshipmen, for the reason that as a midshipman leaves the Academy at graduation, or before because of failure, he is hard put to dispose of furnishings except at great loss from original cost. It is also believed that the academy in these days of modern plumbing should not require the use of the obsolete

wash basin and pitcher and waste jar. A recommendation to the Navy Department for funds to make these desirable changes has not been approved, but in its stead it is proposed that a bill be sent to Congress providing an allowance of $200 to midshipmen on entering the Academy. Under the stress of living costs and conditions at this time it is considered a genuine hardship for parents of poor boys who enter the Academy to be compelled to supply $350 in cash, for the rule specifies that this entrance deposit "must be made before a candidate can be received into the Academy." Permanent fixtures and furnishings, it is believed, should be supplied by the government at the Academy.—*Army and Navy Journal*, 9/6.

INSURANCE MAY BE PAID IN LUMP SUM.—Payment of soldiers' and sailors' insurance to beneficiaries in lump sums instead of installments, when desired, has been recommended to Congress by R. G. Cholmeley-Jones, director of the bureau of war risk insurance. This, with several other changes, has been recommended with a view to making government insurance more desirable, so that all ex-service men will retain it after returning to civil life.

Under the present law insurance is paid only in installments extending over a period of 20 years. There is a strong congressional sentiment against this proposed change. It is also recommended that the list of beneficiaries, which now may include only near relatives, be extended to include aunts, uncles, nieces and nephews when desired.—*The Naval Monthly*, Sept., 1919.

300 OFFICERS SUBMIT RESIGNATIONS. —With the resignations of more than 300 permanent officers of the regular navy already submitted to the department and more arriving daily, Acting Secretary of the Navy Roosevelt has begun work on proposed legislation to be submitted to Congress suggesting substantial pay increases for officers and enlisted men of the navy and marine corps.

High-ranking officers believe the efficiency of the navy is seriously threatened. Most of the resignations have come from the younger officers in the lower grades. These officers, receiving from $1700 to $3000 a year, most of them Annapolis graduates capable of earning much higher salaries in civilian life, say they find it impossible to support their families on their pay.

More resignations are now on file than had been received from the entire regular navy in the last 30 years. Since 1898 the average has been seven a year.—*The Naval Monthly*, Sept., 1919.

OPERATIONS

THE ATLANTIC FLEET AND THE PANAMA CANAL.—Among the various considerations that led the United States Government to build the Panama Canal, the most urgent, undoubtedly, was the desire to bring the Atlantic and Pacific seaboards into close relationship. The new bond that was to be thus established would be two-fold—commercial and military. Of the commercial advantages nothing need be said—they have been manifold from the day on which the first merchant ship passed the canal.

The military advantages of the great waterway are many, and in no direction are they so immediate and invaluable as in the added efficiency and mobility which has been conferred on the United States Navy. Before the canal was cut any warship or fleet of warships that was called upon to pass from the Atlantic to the Pacific, or *vice versa*, was confronted with a 14,000 mile trip. Most of us recall the ever-famous run of the battleship *Oregon* from San Francisco, where she was built, to join Admiral Sampson's fleet in the West Indies. Nor shall we ever forget the anxiety with which her progress down the Pacific and up the Atlantic coast was watched by the nation.

There is no doubt that the strategical situation during the Spanish war proved to be a powerful incentive to the purchase of the French rights at the Isthmus of Panama and the completion by the United States of the great waterway. From the day on which it was opened, it became possible adequately to protect our coasts on either ocean; whereas, so long as the only route from the Atlantic to the Pacific involved a journey of 14,000 miles, it was necessary to maintain the bulk of our fleet where the bulk of our wealth lay, namely on the Atlantic Seaboard. It had always been a matter of concern to the Navy Department that the Pacific coast and its great seaports were so far removed geographically, from the bulk of our fighting fleet that it could receive no immediate assistance in case of attack.

The cutting of the canal has changed all that; and the rapid growth of our fleet, due to the war, now makes it possible to maintain two powerful battleship fleets, one on the Atlantic, the other on the Pacific, under such conditions that the whole fighting strength of the navy can be concentrated in either ocean within two or three weeks' time.—*Scientific American*, 8/30.

THE AMERICAN NAVY'S ACHIEVEMENT.—When hostilities ceased the United States Navy had permanently based in European waters 373 vessels, including eight battleships, 70 destroyers, 120 submarine-chasers, 12 submarines, and over 50 seagoing patrol vessels of various types. There were also 81,000 officers and men serving in Europe, or 15 per cent of the total American naval personnel. The significance of these figures, taken from an article by Mr. F. D. Roosevelt, Assistant Secretary of the U. S. Navy, in the American number of the London *Times*, will be apparent to all who are acquainted with our naval progress. The personnel must equal that of all our seagoing fleets before the war. The destroyers were more numerous than those under Jellicoe's command in the Grand fleet up to the spring of 1916. Thus the material contribution of America in 19 months was remarkable. It would have been still more remarkable but for the sudden termination of hostilities. About the splendid spirit of co-operation shown between the two navies Mr. Roosevelt affirms that, while never doubting for a moment that it would exist when America was able to take her part in the war, a remarkable discovery was made on the day the first U. S. destroyers reported to Admiral Sir Lewis Bayly at Queenstown. This was that the British and American naval forces had been trained along almost identical lines, that the types of ships fitted in well together, and that only slight changes were necessary to make one homogeneous naval force. As Admiral Mayo has truly said, England and America are, and will continue to be, the greater and better friends for the experience that has come out of the cordial co-operation and co-ordination required by the common interest in this war.—*The Army and Navy Gazette*, 7/19.

MERCHANT MARINE

CREWS OF U. S. MERCHANT SHIPS.—The proportion of native-born and naturalized Americans among the officers and crews of American merchant ships during the fiscal year ended June 30, 1919, increased to 47.6 per cent of the total and is now substantially the same as in 1914, but native-born Americans comprised four-fifths of this percentage for the past fiscal year and two thirds during 1914. The change is due in part to young Americans discharged from the navy who have entered the merchant service, to those who under the draft laws preferred the merchant service to the army, and to the appropriation of $6,250,000 by Congress to the Shipping Board for recruiting and training officers, engineers, and crews for American merchant vessels.

The nationality of those shipped as officers (excluding masters) and men (counting repeated shipments) before United States Shipping Commis-

sioners, as returned to the Bureau of Navigation, Department of Commerce, was as follows for 1914 and 1919:

Nationality	1914	1919
Americans (born)	63,247	97,160
Americans (naturalized)	31,417	24,676
British	24,745	26,848
Chinese	64	729
Japanese	98	1,198
Filipinos	472	1,154
Germans	9,497	138
Norwegians	8,194	10,237
Swedes	6,321	10,054
Danes	2,260	5,843
Russians	4,526	10,108
Austrians	3,363	125
French	617	694
Spanish	25,022	24,163
Italians	4,368	2,503
Portuguese	3,921	5,481
Others	11,442	34,811
Unknown	10	

Those classed as "others" are mainly from the countries of South America, citizens of the several states which have been created by the war, and Swiss shipping as stewards.—*U. S. Bulletin*, 9/8.

MERCHANT MARINE PROGRESS.—Coming so quickly from a position at the rear to take rank as one of the first of nations in point of merchant marine, the United States has outstripped in performance the knowledge of most of its citizens. Every one knows we have a Shipping Board and every one has heard that we built ships and then more ships, built them fast and built them faster, and that the results of our labors were the difference between starvation and keeping alive, as far as Europe was concerned.

But few know how this great fleet has been turned to peace-time uses. Not that there is any secret about it, but merely because publicity has not been able to keep up with performance.

Yet the amazing facts are there. We have now eight hundred and twenty-nine ships, government or government owned, aggregating four million two hundred and forty-eight thousand nine hundred and seventy-three dead-weight tons, at the present moment actually engaged in general commerce. This does not include more than 50 per cent as many more dead-weight tons still in use by the army and navy or for overseas civilian food relief. Nor does it include ships owned by private companies and so operated. These ships are the property of the United States, which has put them into service in general and specific cargo work to such good effect that there is a United States vessel carrying United States goods on regular schedule to every important port of entry in the entire world.

A rather different situation to that before the war, when practically all goods shipped from the United States to foreign countries traveled in foreign bottoms.

These ships are giving general cargo service on sixty-two regular lines, following trade routes which have been opened during the last six months. And we are promised that this is but the first step which will convert ocean tonnage, released from war labors, to those peace-time services which will put this nation back where it of right should be—in the forefront among the maritime nations of the world.

There is no reason and less excuse for any shipper in the nation to employ a foreign bottom to carry his goods. No matter where he wants to have them carried, a United States bottom will carry them there. Nor need he say that he must use a foreign bottom because of any particular

port in this country being more convenient to his factory or mine or ranch. Our own boats now sail from many of our own ports, so that we serve ourselves not only with our own vessels, but in the most convenient manner with those vessels.

Note that the sixty-two lines thus established are regularly sailing on schedule, announced in advance. The great advantages of this must be apparent even to the non-shipper. If a man has a cargo or half a cargo of tin cans or pianos, going to anywhere, any country, and happens to strike a tramp ship also going there at the same time he wishes to ship, he can use it and care nothing for an announced sailing. But such coincidences are rare. Most shippers want to know in advance when they may ship, from where they must ship, and what the freight rate will be. The establishment of a regular cargo-carrying service serves the shippers thus, exactly as a regular train service from point to point serves his convenience when he would travel himself. Scheduling departures and approximate arrivals allows the shipper to sell abroad for future delivery with the reasonable assurance of being able to make such delivery within a specified time.

The established trade routes cover the whole world. Thus there are forty-seven steamers sailing to the Argentine and they sail from New York, Boston, Mobile, New Orleans, Wilmington, Charleston, Savannah, Brunswick and Jacksonville. Two steamers go from New York to Pernambuco, Maceio and Bahia, North Brazil. Twenty-five sail to mid-Brazil (Rio and Santos), from New York, New Orleans, Wilmington, Charleston, Savannah, Brunswick and Jacksonville. Five steamers from New York and one from New Orleans make regular trips to the west coast of South America, ranging from Guayaquil, Ecuador, to Valparaiso, Chile. Two steamers go from New York to North Africa and Egypt; five from New York to the Dutch East Indies; two from New York to Bombay and other Indian ports; three from New York to Spain (Barcelona, Valencia, Cadiz, and Seville). Every two months a steamer goes from the metropolis to Danzig, and every six weeks one or two steamers sail out the Narrows to Constantinople and the Black Sea ports. Three steamers sail from New York to West Africa, two to South Africa, three to Australia and New Zealand, and three to China, Japan and the Philippines. Fifteen steamers leave the Golden Gate, one every ten days, for China and Japan, and two more from the same port go to Europe via the Far East.

We have a steamer from New York to Genoa, and one from Baltimore to the same port; while two serve Grecian ports from New York. To London we send six steamers from New York, three from Philadelphia, two from Baltimore and one from Norfolk. We send six to Liverpool from New York, two from Boston, five from Philadelphia, one from Baltimore, one from Norfolk and one from Galveston. New York says good-by to three ships clearing for Glasgow on monthly sailings, four to le Havre, and three to Bordeaux. The latter port is also served from Boston and Baltimore with two and one steamers respectively. New York sends two steamers to Marseilles and seven to Antwerp, while two from Boston, and one each from Philadelphia and Baltimore go to the same destination. Rotterdam sees New York ships to the number of ten and from Philadelphia, two. Copenhagen and Gothenburg are served by five steamers from New York while the West Indian ports are visited regularly by two steamers from Wilmington, two from Charleston, two from Savannah, two from Brunswick and two from Jacksonville.

Meanwhile, the balance of the list of ships is engaged in going to every port of the world where a cargo can go—and the flag at the stern is the stars and stripes.

It would be pleasant if it could be chronicled just what the future will hold for these ships, and the trade lines thus established. But to state this would require a prophetic vision of what the Congress is going to do. At the present time the ships are the property of the United States and by it

given over to private organizations, shipping combinations, individuals, firms, partnerships, etc., under certain terms. The United States gets paid for the use of its ships; they are emphatically not, as some soap-box orators have stated, built by taxes and given to the wealthy to operate for nothing.

When a firm has satisfied the Shipping Board that it is financially responsible, experienced in business, and that it has the confidence of other business men, it is able to make a contract with the United States, through the United States Shipping Board Emergency Fleet Corporation, for the use of one or more ships. This contract is a new document in shipping annals, for never before has the United States engaged in shipping as a sort of half-partner in the firm. It provides that the Emergency Fleet Corporation "will man, equip, victual and supply the vessel, and provide and pay for all provisions, wages, and consular, shipping and discharge fees of the master, officers and crew and all cabin, deck, engine-room and other necessary stores and will exercise due diligence to maintain the vessel in a thoroughly efficient state, in hull, machinery, tackle, apparel, furniture and equipment for and during service."

On the other hand, the operator as agent for the Corporation must operate as the Corporation directs as to voyages, cargoes, priority of cargoes, charters, freight rates, etc. The operator provides and pays for fuel, fresh water, stevedoring, port charges, pilotages, agencies, commissions and consular charges except as specified, and all such expenses as usually are borne by the time-charterer of a vessel. It is the business of the operator to collect the freight charges and in such a manner as will insure to the Corporation its revenue from such freight charges.

For his labors and his capital invested the operator receives his pay in the form of commissions. Thus, on all vessels except oil tankers he receives a commission on general cargo of 2½ per cent on the gross ocean-freight list. On bulk cargo he gets half as much, the term bulk cargo meaning one of which 50 per cent or more is loaded at and discharged at one port and covered by one bill of lading; also all United States Government cargoes when the vessel is exclusively so laden. The operator gets a port fee of $250 when coming into United States ports from foreign or dependency ports and a 5 per cent commission on all mail, express and commercial passenger revenue.

In a few words and short, the United States owns and "finds" the ship, the operator runs it, the United States gets the freight and pays the operator a commission on that freight.

So far, this dual system has worked out as well with the United States as owner as it would with a private owner time-chartering the vessel to an operator. The speculative feature is pretty well eliminated from shipping operations, but at the same time, the risk of chartering a vessel of uncertain or weak ownership is also eliminated. If the operator is unable to take advantage of the fact that he may charge what freight rates the traffic will bear, and must charge what the Corporation says, he is also protected against an unseaworthy ship, against trouble with pay of officers and crew, against objections to food or findings. And he has the greatest country in the world behind him, and the knowledge that though he, as agent, is the responsible head of the voyage, he has also all the power of the country back of him in any port he may enter, for this is not a privately owned but a government owned boat.

The freight rates established by the Shipping Board are published and anyone can obtain them at any time. Anyone may learn at any time just when a ship is to sail for any port, the probable time of her arrival, what space is available for his cargo, what it will cost to carry it. The United States is seeing that its ships are run more like a railroad schedule than anything else, and while of course breakdowns at sea and the unforeseen in storm or accident may prevent a vessel from keeping to schedule, the

probabilities are much in favor of a ship sailing when it is scheduled to sail and arriving when it is scheduled to arrive.

It is the general consensus of opinion that this good start will remain a good start only if it have a different finish. It has been recommended to Congress that the ships be turned over to private enterprise by sale, according to certain carefully worked out plans, so that within a short period of years all this floating property shall belong to shipping lines rather than to the government. Just what disposition Congress will make of this recommendation, just how long it will continue what is in effect, if not in fact, a ship subsidy to operators, no man knoweth. But this much is certain. The government has demonstrated (1) that there is use and plenty of it for a great fleet of merchant marine flying our flag from our ports; (2) that it is perfectly possible to make money by operating these ships at fair freight charges, under existing laws; and (3) that there is no fundamental reason why this country cannot keep what it has gained in getting, through the war, a great fleet of cargo carriers. It is for intelligent action of the future to see that we do keep it.—*Scientific American*, 9/6.

NAVIGATION AND RADIO

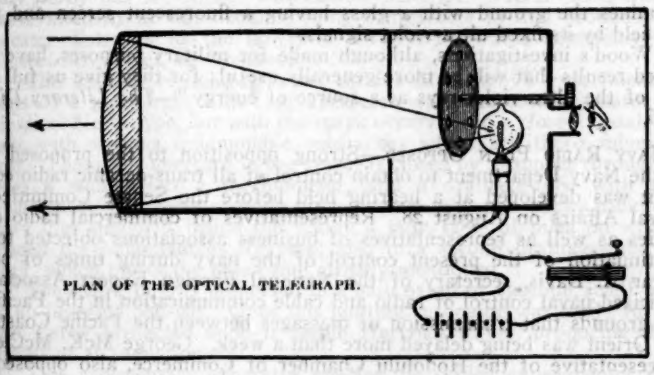
NAVY TO AID VESSELS ON GREAT LAKES.—Instructions were given by the Navy Department on August 22 for the inauguration of a Great Lakes patrol to assist vessels navigating those waters. The project embraces the detailing of a large vessel to operations on each of the lakes, though only four could be detailed at this time of the shortage of suitable craft. Eventually, should the coast guard be retained permanently in the navy, new mine sweepers will compose the Great Lakes patrol. On account of the engagement of the sweepers in removing the North Sea mine barrage, only two sweepers can be spared for the lakes this fall. The orders issued on August 22 detail the mine sweepers *Owl* and *Pigeon*. Assisting them will be the sea-going tug *Tadousac* and the coast-guard cutter *Morrill*, and all will be in charge of officers thoroughly trained in coast patrol work. It is expected that the patrol will be in operation about September 15 and will continue until navigation closes. Coincident with the patrol of the lakes to aid vessels in distress and to save life and property, the ships will assist the Department of Commerce in the enforcement of the navigation and motor-boat laws.—*Army and Navy Journal*, 9/6.

THE GYRO-COMPASS IN MERCHANT SHIPS.—The Sperry Gyro-Compass, which was employed with highly satisfactory results in many Allied surface and submarine war vessels during the hostilities, is now, as was confidently expected, making headway in the world's mercantile marines. The new compass has been installed in the Cunard liner *Aquitania*, and among the orders in hand are one for the White Star liner *Ceramic*, one for the Canadian Pacific liner *Empress of France*, one for the Den Norske Amerikaline's vessel *Bergensfjord*, one for the "Lloyd Sabaudo" liner *Re d'Italia*, and one for the liner *Lutetia*, owned by the Compagnie de Navigation Sud-Atlantique. The *Aquitania* has completed a round trip to New York since her Sperry Gyro-Compass has been installed, and the results have been highly satisfactory. The master and his officers are enthusiastic about its work, and state that their expectations have been more than realized. The *Ceramic's* gyro-compass is to be installed before the vessel leaves on her next voyage to Australia.—*Shipping*, 8/23.

INVISIBLE SIGNALS.—Signals that can be rendered visible to those who are to receive them, while remaining invisible to all else, have undoubted advantages from the standpoint of secrecy which would make them valuable in military operations. Such signals were used in the recent war, owing to the inventive skill of an American, Prof. R. W. Wood, of Johns Hopkins University, whose work with invisible rays, especially in pho-

tography, has been noted from time to time in these columns. Professor Wood's plan is to use a source of invisible rays, either those below or above the visible spectrum, and to employ a receiving instrument that makes them visible again. No one not provided with the proper receiver could have any idea that signals of any kind were passing. We translate, inpart an account of Professor Wood's apparatus, contributed to *La Nature* (Paris, May 31), by H. Vigneron. Writes this author:

"First Professor Wood perfected the classic devices of optical telegraphy. In one of the systems in service in the German Army the signals are made by an electric lamp placed inside a tube which enables the sender to direct the light-beam as he chooses. Field-glasses fitted with this system enable a soldier to observe the signals sent in reply. The batteries supplying the lamp are placed in the belt shown in the illustration. All the apparatus of optical telegraphy are based on the same principle. The improvement introduced by Wood consists in increasing the precision of the transmitting instrument so that the size of the light-beam may be greatly diminished and secrecy thus insured, the signal being visible only at the receiving-station.



PLAN OF THE OPTICAL TELEGRAPH.

"The device consists of an achromatic lens at whose focus is a nitrogen-filled, metal-filament lamp operated by a battery of five dry piles and fitted with an ordinary Morse key. Behind the lamp is an eyepiece through which the receiving-station is exactly visible.

"When the sender looks through the eyepiece he sees the image of the lamp-filament projected against the landscape and is able to hold the device so that this image falls precisely on the receiving-station. . . . .

"With this apparatus and the nitrogen lamp, communication may be maintained up to distances of 18 or 20 miles, the diameter of the light-beam at one and one-quarter miles not exceeding six feet. The weak point of this method may be seen at once: if the trenches are very near it is impossible to communicate with the receiving-station without the enemy's also getting the signals. The system, therefore, had to be modified. Professor Wood did this by using invisible light-rays for the signals. It is well known that under this general term are included infra-red and ultra-violet rays.

"If we place before the lamp a screen that allows only these infra-red rays to pass . . . . these will not be perceived directly by the eye; but if at the receiving-post a similar device be used the observer will see the black field of his glass illuminated in red. Owing to this arrangement, secrecy is assured and the device may be used in this way at distances of five to six miles.

"To utilize the ultra-violet ray—and this is the most original feature of Mr. Wood's inventions—this scientist has succeeded in making a kind of glass absolutely opaque to the visible rays, but perfectly transparent to the ultra-violet. This glass, composed of silicate of soda and nickel oxid, therefore, looks opaque to the eye, and to observe the rays that pass through it a detector is necessary. Wood utilizes the fluorescence of some such substances as platinocyanid of barium. In these conditions the range is five to six miles."

For marine signaling, where a greater range is necessary, Professor Wood, we are told, increases the intensity of the ultra-violet ray by using an ordinary mercury vapor-lamp surrounded by a screen of the special glass just described. If a ship carries two invisible signals of this sort at a standard distance apart, the observer, looking through his detector, can tell how far away she is. To quote further:

"At the entrance of a port, in a channel, if the buoys are painted with a flourescent substance and the ship is supplied with a projector of ultra-violet rays, when the invisible beam strikes the buoy it will shine out clearly.

"To facilitate the landing of airplanes and the marking of aviation fields, the ultra-violet rays may be similarly used. The aviator seeking to land examines the ground with a glass having a fluorescent screen and finds his field by its fixed ultra-violet signals.

"Wood's investigations, although made for military purposes, have produced results that will be more generally useful; for they give us full control of the ultra-violet rays as a source of energy."—*The Literary Digest*, 8/16.

NAVY RADIO PLAN OPPOSED.—Strong opposition to the proposed plan of the Navy Department to obtain control of all trans-oceanic radio equipment was developed at a hearing held before the Senate Committee on Naval Affairs on August 28. Representatives of commercial radio companies as well as representatives of business associations objected to the continuation of the present control of the navy during times of peace. Oscar K. Davis, secretary of the National Foreign Export Association, criticized naval control of radio and cable communication in the Pacific on the grounds that transmission of messages between the Pacific Coast and the Orient was being delayed more than a week. George McK. McClellan, representative of the Honolulu Chamber of Commerce, also opposed the retention of trans-oceanic communication by the Navy Department, declaring that under the present management facilities for the transmission of commercial messages are congested to such an extent that the cable and wireless communication is rendered almost as slow as the mails.—*Army and Navy Journal*, 9/6.

GOVERNMENT WIRELESS STATION.—According to the U. S. Bureau of Census, it is learned that the government has erected wireless plants at various points along the Atlantic and Pacific coasts and at Pearl Harbor, Hawaii, and Cavite, in the Philippines. The government shore stations, according to the reports of the Bureau of Navigation, numbered 135 on June 30, 1918, of which 88 were in continental United States, 20 in Alaska, 19 in the Philippines, 3 in the Canal Zone, 2 in Hawaii and 1 each in Porto Rico, Guam, and Samoa. The government ship stations totaled 470. The station at Arlington, Va., has been in regular communication with the station at Chollas Heights, near San Diego, Cal., since May 1, 1917. Direct communication with an Italian government station in Rome was also established. On September 29, 1917, radio communication was established between Arlington and Pearl Harbor, Hawaii, via Sayville, N. Y. Messages are now transmitted between Arlington and the Philippines through San Diego, Cal., and Pearl Harbor, Hawaii. Under favorable conditions, at night, the Arlington station can communicate directly with the Pearl Harbor station, but the usual practice is to relay through San Diego.—*Scientific American*, 8/30.

FIRES STARTED BY WIRELESS.—After that blazing airship fell in the "Loop District" of Chicago, killing a dozen people and completely wrecking a great bank, some one recalled that it had passed near a high-power wireless plant and suggested that the gas in the balloon might have taken fire from a wireless spark or wave. Whether this spectacular accident was due to this or some other cause, it is at least certain that our progress in both aviation and radiotelegraphy is likely often to bring wireless waves into close touch with highly inflammable gas-bags carrying people and valuable cargoes. And the Chicago catastrophe lends immediate interest to the announcement of a French scientist, Mr. George A. Leroy, of the Municipal Laboratory of Rouen, France, that he has proved that an ordinary wireless telegram may actually start a fire. His investigations were described by Jacques Boyer in an article contributed to the *Scientific American* (New York, June 14). Mr. Leroy's discovery was stimulated by several lawsuits in which fires were asserted to have originated from the electric waves set up by wireless apparatus. He showed the correctness of these charges, or at any rate indicated their probability, through an apparatus of his own, named by him an "igniting resonator." By its means Mr. Leroy has set on fire combustible materials several yards away, the wave intensity at this distance being comparable to that produced at far greater distances by the powerful wireless apparatus commonly in use. Writes Mr. Boyer, in substance:

"The igniting resonator, as set up for Mr. Leroy's experiments, consists of a glass bulb with four apertures, operated as a resonator of the classical Hertz type, but with the spark occurring in a closed vessel, in contact with various inflammable substances which are there submitted to test. The upper aperture in the vessel is closed by a stopper through which pass a manometer, a thermometer, and a drainage-tube with a cock. Opposite it, the lower opening gives passage, through heavy packing, to a wire that supports, inside the vessel, a light table of mica on which are placed the inflammables for test; also to a second drainage-tube with a cock, which meets the upper one already mentioned.

"The entire bulb is immersed in a bath of oil of vaseline, itself enclosed in an inverted bell-vat. Once this igniting resonator was ready for action, Mr. Leroy projected upon it feeble Hertzian waves, producing these by means of an induction coil.

"This rudimentary apparatus enables the skilled experimenter to show without doubt the incendiary action of the Hertzian waves, although their electric intensity is a minimum in comparison with the power of the large wireless stations now in service. In particular, Mr. Leroy has set up at some meters' distance inflammation of combustible materials such as gun-cotton, tinder, cotton, worsted, tow, paper, etc. For example, by his observations upon small bales of cotton enclosed in jute wrappers with iron bands, as this material is ordinarily packed for shipment, he explains in the following fashion the mechanism of so-called spontaneous combustion which at times bursts out in warehouses or on board ships:

"In the course of handling, one of the hoops which encircles the bales of raw cotton breaks or comes loose under the action of shock or some other cause, and a small fragment of the metal projects in such way as to form a miniature Hertzian resonator. Then, under the influence of the wireless waves sent out from some station, sparks pass and immediately inflame the covering of the cotton in their immediate vicinity. Equally, the contact between the metallic bands of the bales, piled one on another in a car or packed in the hull of a boat, may establish an electric circuit offering the conditions of capacity and self-induction necessary for the production of the phenomena of resonance. In consequence, when the circuit finds itself interrupted by imperfect contact between two bales, incendiary sparks, apt to inflame the cotton, are likely to be produced."—*The Literary Digest*, 8/9.

ORDNANCE AND GUNNERY

U. S. NAVY'S NEW TYPE RAILWAY MOUNT.—Tests with most satisfactory results were made early this month at the Navy's new proving ground at Dahlgren, Va., of a new U. S. Navy type of fourteen-inch railway mount, Mark II, designed for use in high angle ranging work, and has a mobile mount for proving ground use. This mount was evolved by the Bureau of Ordnance, Navy Department, of which Rear Admiral Ralph Earle is chief, to meet conditions requiring rapid shifting from one place to another on the battlefront. The Mark I mount, which was used successfully on the west front during the latter months of the war, required about a day's time to prepare for firing, owing to the necessity of digging a pit and constructing a foundation therein to take the recoil load of the gun. The use of this pit also limited the amount of train which could be obtained in any one emplacement, this amount of train being about two and one-half degrees, which was provided on the gun girder to traverse it through this angle.

The Mark II design was gotten up to permit firing from the rails without the necessity of digging a pit and any degree of train could thus be obtained by the use of a circular track. The height of the trunnions was consequently raised so that the gun could be elevated to an angle of 40 degrees, and still clear the track. In this position, however, the total height of the gun in a level position was so great that it was not possible to transport it under bridges, through tunnels, etc. To meet this condition it was therefore necessary to provide an elevating arrangement so that the gun could be raised into its firing position and lowered into its transporting position to come inside the clearances specified for French railways. To do this the deck lugs, instead of being rigidly bolted to the gun girder, were mounted on slides inclined at an angle of forty-five degrees, and two hydraulic rams, one on each side, were fitted for raising the gun, and its carriage. To secure the carriage or gun girders in both the elevated and lowered positions heavy auxiliary trunnion pins were provided to pin the deck lugs to the gun girders. The firing load and also the dead load were thus transmitted to the gun girders by means of these pins and the slides fitted as described at an angle of 45 degrees.

The deck load of the whole mount is carried by four sets of trucks with five axels to each truck, thus making a total of 20 axles or 40 wheels. The overall wheel base is about 83 feet. With the load thus distributed, no reinforcement of the track is necessary. The use of five-wheel trucks involved a new design of equalizing system in order to insure that each axle would carry its share of the load, and this detail had to be worked out by the bureau designers co-operating with the design section of the Baldwin Locomotive Works Company. On the front end of the gun girder gasoline engines are fitted, one to drive a hydraulic pump necessary to elevate the gun to its firing position, and another motor which can be connected either to the winch for traversing the mount along the rails or to an air compressor which is utilized to furnish air pressure for gas ejecting for the operation of the breech mechanism and for assisting the springs in bringing the gun back to battery at high angles of elevation. The counter recoil springs, being the same as used for turret mounts, were naturally not designed strong enough to do this work at the high angle of elevation of 40 degrees. In addition to the power-driven hydraulic pump four hand pumps are supplied as an auxiliary means for elevating the gun to its firing position in case the power system is out of order. Owing to the great weights to be raised, however, this system, although effective for the purpose, is naturally very slow.—*Army and Navy Journal*, 9/6.

RE-GUNNING A BATTLESHIP'S TURRETS.—How long do guns last? Visitors to battleships of the United States Navy often ask that question, after seeing huge naval guns at close range for the first time. The answer surprises them, for they invariably think that guns last indefinitely, and once

installed in a turret remain there until the ship becomes old and obsolete and is eventually placed out of commission.

Modern cannon are comparatively short-lived. The cannon of past decades were smooth-bores which fired round shot and, although the scouring effect of powder gases might enlarge the bore to almost any extent, the question of accuracy was of no great importance. Gunners did not ignite the fuse until they "saw the whites of the enemy's eyes." In order to accomplish this the daring captain always endeavored to get into close range and even lash his ship alongside the enemy, depending upon the ability of his gunners to fire more shots, than the latter, thus winning a quick decisive victory. Besides it was practically impossible for the old style cannon balls to penetrate the thick wooden hulls of the men-of-war of the age except at close range.

High-powered naval rifles are built of sections superimposed upon a rifled tube or liner. At first the liners were cylindrical, but to facilitate removal they are now made conical in shape on the outside. The outer sections, usually known as hoops are shrunk on to the liner by the application of heat, the outer diameter of the liner being slightly in excess of the inner diameter of the hoop shrunk upon it. This construction is known as the principle of "initial tension"—*i. e.*, the increased resistance of a tube constructed of several concentric cylinders assembled over a single tube causes a stress between them. This stress is one of compression on the inner cylinders and extension on the outer, and necessarily varies in intensity. The resultant stresses increase the resisting power of the gun to internal pressure.

After the tube and hoops are assembled the gun is rifled. This consists of cutting spiral grooves in the bore, which is done in order to impart a rotary motion to the projectile, thus preventing it from tumbling during its flight from the gun to the target. As both gun and projectile are made of steel, it is necessary to fit a comparatively soft though tough copper rifling band near the base of the shell. The rifling cuts into the band as the shell advances through the bore, thus imparting a spinning or gyroscopic motion. As it speeds on its way the longitudinal axis of the shell is always tangent to the trajectory or curve of flight.

The intense heat caused by the expansion of gases produced by the burning powder is imparted to the walls of the gun, and the speed of expansion of the gases as they propel the projectile through the bore, scours the interior surface of the metal and quickly wears out the rifling. This is known as "erosion." When erosion progresses to the extent that accuracy of flight is impaired, the gun must be relined. Thus it may be inferred that the life of a gun is measured by its accuracy. The actual number of shots which can be fired from naval guns of varying calibers before accuracy is seriously impaired, has been determined by experience, and in the United States Navy is over 250 rounds.

In order to maintain the navy at the highest point of efficiency in gunnery, target practice is frequently held under conditions closely simulating actual battle. As a result, the guns wear out and must be replaced. It is a fixed policy of the navy extending over years, that all guns mounted on board ship must at all times be capable of firing their full battle allowance of ammunition without loss of accuracy. The battle allowance depends upon the limited space for stowage in the magazines; and when it is understood that the weight of a 14-inch shell is 1400 pounds and a full charge of powder with its container weighs 323 pounds, a total of 1723 pounds, occupying 12.5 cubic feet, the great amount of space, required for the stowage of ammunition for the twelve 14-inch guns of our modern superdreadnoughts can be realized.

The navy maintains a reserve of guns on shore amounting to 25 per cent of the number afloat. These reserve guns are kept in excellent condition, ready at a moment's notice to replace those which have become worn out. The operation of replacing turret guns is one of the many things the navy

has to do in order to be ready at all times to perform its allotted task. The work must be speedily done, for a battleship laid up at a navy yard is a dead loss to the fleet.

When it becomes necessary to replace the guns of a battleship, the latter proceeds to a navy yard where new guns shipped from the reserve stock at the Naval Gun Factory awaits her. Workmen swarm on board and in a short time remove the turret top and front plates. The delicate gunsights whose working parts are machined to a ten-thousandth part of an inch are carefully removed and as carefully stowed away. The slightest burr or scratch might easily cause the gun to be fired with such great inaccuracy as to be entirely useless. Gun elevating gears and recoil cylinders are disconnected, electric firing circuits are removed and the turret has the appearance of being hopelessly dismantled. When all gear is cleared away, a huge floating crane comes alongside and lifts the gun and sleeve out of the turret, transferring it to blocking on shore. The sleeve is removed and placed on the new gun and the latter is then hoisted on board. A 14-inch gun without accessories of any sort weighs 198,000 pounds—a mass which cannot be toyed with.

After the new guns have been installed in place, the turret top and front armor plates are bolted on. Gunsights, elevating gears and all other mechanisms are assembled, and then a most important operation is commenced. The interior of the turret is thoroughly scrubbed and painted by the turret crew, while the turret captain and gunner's mates clean and polish the guns.

Worn-out guns are by no means consigned to the scrap heap, for they have many years of usefulness before them. The Naval Gun Factory has a large stock of liner forgings always on hand ready to be inserted in guns whose accuracy has been impaired by continuous use. There thousands of the most skilled mechanics in the world work day and night to keep pace with the navy's requirements. When the worn-out gun arrives it is placed on end in a vertical furnace where it is heated, after which the old liner is knocked out and a new one inserted. For this operation the gun is placed muzzle down in a furnace and heated to a temperature varying from 400 degrees F. to 500 degrees F. A powerful crane lifts the new liner to a position over the furnace and lowers it into place after which it is cooled by sprays of cold water. Hydraulic jacks are used to prevent the liner from crawling out during the cooling process.

When the gun is perfectly cool it is removed from the furnace, and placed in a lathe. It is then chambered, rifled, and fitted with breech mechanism. After being carefully inspected by an officer it is sent to the Naval Proving Ground for test by firing. At the conclusion of this test it is ready for issue to the service, as good as it was when entirely new.—*Scientific American*, 8/16.

AN ANTINOISE TELEPHONE.—"Since the days of its earliest development, the telephone has been tried out at various times for communication from bridge to engine-room and between other parts of power-propelled vessels. That it has been found conspicuously wanting in these trials is apparent from the fact that communication from bridge to engine-room, and *vice versa*, is still chiefly effected by means of such mechanical and electro-mechanical devices as the ship's telegraph, etc., and even by the antediluvian speaking-tube.

"With the enormous use of the airplane as a fighting and observation unit during the European war, there developed constantly new reasons why rapid and efficient means of inter-communication were necessary—both between the pilot and the bombers or observers aboard the same craft, and also from airship to ground and the reverse (in the latter case, of course, by means of wireless telephony).

"To those who have been in the vicinity of unmuffled gasoline or other internal-combustion engines under test, it is superfluous to say that the noise they emit precludes any sort of conversation near by—except, of

course, by some means such as sign language. With the twelve cylinders of a Liberty airplane motor exhausting directly into the air alongside the fuselage of an airplane (or, in the case of a twin-motor plane, twenty-four cylinders), the problem of providing easy communication among the crew of that airplane seemed, at first glance, impossible of solution. The tendency of a telephone transmitter of any type previously developed to pick up every noise in its vicinity, as well as the vibrations of the voice directed against it, is only too well known to those who have attempted to use the telephone in any noisy locality. This evil is known in telephone parlance as 'side-tone,' and the best brains of the telephone engineering profession had been combating it for years.

"Confronted with such a problem as this, Edwin S. Pridham and Peter L. Jensen, engineers of the Magnavox Company of San Francisco and pioneers in the adaptation to commercial use of the electrodynamic principle in telephone receivers, took one of the boldest steps ever taken in telephone development, and, by so doing, produced the Magnavox 'antinoise' telephone transmitter.

"It was this transmitter, invented by these two Californians under war-pressure . . . . that enabled virtually perfect telephonic intercommunication among the members of the crews of America's combat airplanes, and equally efficient wireless telephone communication with the ground, from heights as great as ten thousand feet."

How Jensen and Pridham solved the problem of overcoming the noise of two thundering, unmuffled Liberty motors and enabling the use of telephones only a few feet from them is interesting because the step they took was both simple and daring. We read:

"Every previous attempt made by telephone engineers—many of them world-famous—to overcome outside noise influence or 'side-tone' in the telephone transmitter had been by trying to exclude noise with 'sound-proof' cases, padding and the like.

"Pridham and Jensen boldly opened the diaphragm and button of the transmitter and let all the noise in—impartially to both sides of the diaphragm. The result was entire exclusion from the circuit of every sound save the voices of the users; and the inventors at once patented the method, the extreme simplicity of which impresses itself forcibly on every one who hears a demonstration.

"The idea is simple. Conceive a big Chinese gong or tomtom struck on both sides at once, in the same spot, by hammers of equal weight. The blows being equal, the gong will not vibrate. But if a light tap be administered on one side only, at the same time, with a smaller hammer, the gong will vibrate in proportion to the tap of the little hammer. In the case of the transmitter, the outside noise (affecting both sides of the diaphragm equally) is analogous to the two hammers; the voice waves to the smaller hammer.

"All of this brings us back to the question of telephone intercommunication between the bridge of a steamship or motorship and the noisy parts of the ship—main engine-room, refrigerating engine-room, steering engine-room aft, boiler-room, wireless-room, etc. Demonstrations of the performance of the Magnavox 'antinoise' telephone under severe and actual service conditions convinced the representatives of the Emergency Fleet Corporation that it was the long-desired means of unimpeded telephonic intercommunication amid the perpetual din in the vitals of a power-driven ship. As a result, merchant ships now under construction in Pacific coast shipyards are being equipped with Magnavox 'antinoise' marine telephones.

"These marine telephones embody not only the same transmitter that revolutionized intercommunication on board and to and from army and navy airplanes, but also the electrodynamic type of telephone receiver, which is far superior in speech reception and reproduction to the old type of electromagnetic receiver employed in the familiar commercial form of telephone.

"In addition to embodying these two vital features, the 'antinoise' transmitter and the electrodynamic receiver, these instruments bear ample evidence of having been carefully and thoughtfully designed to meet all of the unusually severe conditions that must be met by electrical apparatus of any form on board ship. . . .

"A word here about the technicalities of the electrodynamic type of telephone receiver may not be amiss. In this form of receiver, the vibrating element is a flat coil of wire, and not a soft iron diaphragm, as in the old electromagnetic type. This flat coil of wire is rigidly attached to a bronze diaphragm, in such a position that it cuts the lines of magnetic force passing between the pole pieces of a permanent magnet. The passage of the fluctuating voice-currents through this coil causes it to vibrate in this magnetic field synchronously with the vibrations of the transmitter diaphragm at the other end of the circuit; and inasmuch as the coil is always at a fixed distance from the pole pieces of the magnet, the reproduction of speech effected by it, through the attached receiver diaphragm, is far clearer and more faithful to the original than ever has been attained by the common or electromagnetic type of receiver. . . . .

"One unique test that was made consisted in placing a telephone equipped with the 'antinoise' transmitter inside the steel shell of a boiler. With several men outside the boiler pounding on the shell with hammers, a person inside was able to telephone to those on the outside without interference from the din of the hammering."—*The Literary Digest*, 6/14.

ENGINEERING

PRESENT STRIKING USE OF X-RAY IN METALLURGY.—Progress in the examination of solid materials with the X-ray has been rapid in recent months and some surprising results have been recorded. This is particularly true of British and French research. The facts were brought out at a recent meeting in England.

One of the earliest applications of the X-ray to metallurgy was in the detection of flaws in steel and other metals. Recent experience shows that, with the present apparatus available, it is possible to detect very small flaws in steel two inches thick. London experimenters announce, however, that apparatus has lately been devised with which it is confidently expected to penetrate steel up to nine inches thick. French cast-steel brackets for gun carriages have been shown by this test to be faulty, and the method of manufacture was changed resulting in a correction of the defects. The entire internal structure of cartridges and high explosive shells has been profitably examined without injury to the object and welds have also been found imperfect by the same agency. The application of these developments opens up a wide field of advantage to the metallurgist.

Still more interesting is the possible use of the X-ray in analysis. When the percentage of an element of high atomic weight such as tungsten is considerable, as in tool steel, the metal is not so permeable to the rays as when the percentage is low. It appears possible to apply radiography to rapid analysis in particular cases, as the separation of carbon from tungsten and alloy steels.

Another valuable development involves the examination of carbon electrodes for electric furnaces. The suggestion is made that the best use of radiographic examinations would probably consist in systematic experiments on electrode manufacture where variations in composition, baking temperature, etc., would proceed step by step. Internal causes resulting in premature and frequent breaking in service may thus be detected. Already the visual examination of aircraft timbers has yielded valuable results. No difficulty has been found in detecting concealed knots, resin pockets and grub holes, or excess or deficiency of glue in glued joints.

Examination of materials without destruction of the object has been a desideratum for many years. Its partial realization seems nearer as inves-

tigations proceed. Not only radiography but magnetic analysis are important factors in this evolution. Further work must decide to what degree these new developments in radiography will result in non-destructive testing. Already the results are striking and the goal nearer.—*Scientific American*, 8/23.

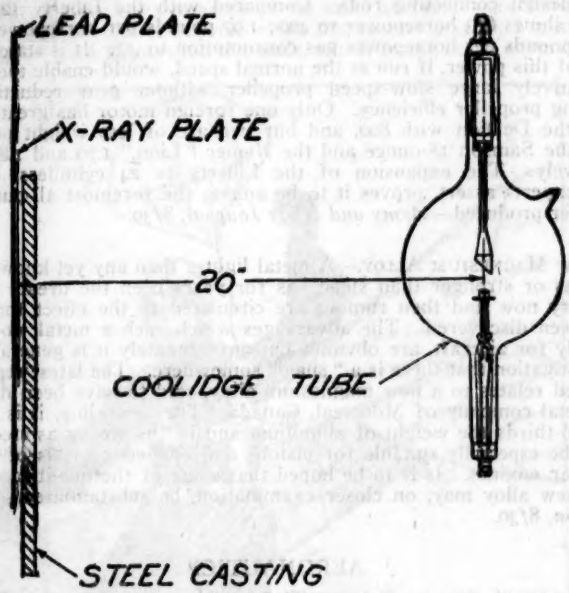


DIAGRAM OF ARRANGEMENT OF COOLIDGE TUBE FOR TAKING RADIOGRAPHS OF STEEL CASTING.

ELECTRIC SUPER-SUBMARINES.—Designs for a new type of super-submarine have been elaborated by Capt. Norman Wood, R. A. F., who recently read two papers on the subject before the Institute of Marine Engineers in London. Previous to his connection with the Royal Air Force, Captain Wood was engaged on submarine work and had practical experience of the deficiencies which exist in the design of even the latest vessels. On the surface submarines are driven by Diesel oil engines; under water they are driven by electricity from storage batteries which must be charged when the vessel is on the surface. These conditions are usually met by arranging the following chain: (1) Diesel engine, (2) clutch, (3) electric motor, (4) clutch, (5) propeller shaft. It is not difficult to see that this equipment involves a complex series of operations at critical times, as, for instance, when the vessel is caught by an enemy searchlight when the batteries are being charged. Captain Wood, continues *Electrical Review*, proposes to simplify the transition from engine drive to motor drive (or *vice versa*) by adopting an all-electric drive, using, in a 1200-ton boat, two oil engines to drive electric generators supplying current to electric motors used on propeller ships, both naval and mercantile, on the ground that the growth of air power will render submersion the only means of escape from aerial attack. From this standpoint sea power will include air power and submarine power as well as strength in ships of the old type.—*Scientific American*, 8/23.

LIBERTY MOTOR WITH TWENTY-FOUR CYLINDERS.—An experimental test of a 24-cylinder Liberty X-type motor recently conducted at McCook Field shows that this motor compares favorably with successful tests of foreign motors of approximately the same horsepower. The test engine was built of standard Liberty 12 parts, involving few changes, consisting in the main of two regular crank case upper halves, one somewhat altered, and special design connecting rods. Compared with the Liberty 12, the 24-cylinder shows 673 horsepower to 400; 1.97 pounds per horsepower to 2.11, and .55 pounds per horsepower gas consumption to .51. It is stated that an engine of this power, if run at the normal speed, would enable the use of a comparatively large slow-speed propeller without gear reduction, thus increasing propeller efficiency. Only one foreign motor has greater horsepower, the DeDion with 800, and but two are of less weight per horsepower, the Samson 18-ounce and the Napier "Lion," 1.76 and 1.86 pounds respectively. The expansion of the Liberty to 24 cylinders, explosive engine experts assert, proves it to be among the foremost all-purpose designs ever produced.—*Army and Navy Journal*, 8/30.

A NEW MAGNESIUM ALLOY.—A metal lighter than any yet known, and as strong as or stronger than steel, has for years been the dream of many, and every now and then rumors are circulated to the effect that at last it has been discovered. The advantages which such a metal would have, especially for aircraft, are obvious, but unfortunately it is generally found on investigation that there is a "snag" somewhere. The latest report to be circulated relates to a new magnesium alloy, said to have been discovered by a metal company of Montreal, Canada. The new alloy, it is stated, is only two-thirds the weight of aluminum and is "as strong as steel." It is said to be especially suitable for pistons and connecting rods of aero and motor car engines. It is to be hoped that some of the qualities attributed to the new alloy may, on closer examination, be substantiated.—*Scientific American*, 8/30.

AERONAUTICS

PARACHUTING FROM A PLANE.—The parachute as a means of escaping from a damaged airplane has been much discussed, but its use has not yet assumed a practical aspect. The Germans are said to have practised it to some extent, but Lieut.-Colonel H. S. Holt, who writes in the "Aeronautical Engineering" supplement to the *Aeroplane* (London), says that after making careful inquiry overseas, although he found records of some escapes of this kind, he discovered not a particle of evidence that any of them had been made while the plane was actually falling. He considers some new form of mechanism necessary, and he has devised what he calls an "autochute," or compound parachute system, in which the release of the main parachute is effected by a smaller or "pilot" parachute, which is released before the man jumps and relieves the strain on the large parachute at the moment of opening. This strain, he says, is usually a variable quantity, depending, in the case of a parachute launched from a captive balloon, on the distance it falls before opening. If the parachute is launched from a rapidly moving airplane, additional and severe strains may be thrown on the fabric. In the compound or tandem parachute system the strain on the main parachute is always the same within small limits, and can be accurately estimated. The pilot parachute opens first and then withdraws the main parachute from its case. Writes Colonel Holt:

"By simple timing devices the release of the main parachute can be delayed as long as desired; but the strain on it when opening will always be the same, because a well-designed pilot parachute attains its terminal velocity in a few feet.

"In certain cases the writer employs a secondary pilot parachute of very small diameter and made of as light and thin a material as possible, whose function is to draw out the first pilot parachute. This is only necessary where the first pilot has to be made of considerable diameter and very strong and heavy.

"Theoretically the strain on the main parachute can be reduced to any extent by varying the relative areas of the main and pilot parachutes. But practically there are limits beyond which one cannot go; as, for instance, if one made the pilot larger than the main, which would be an absurdity.

A "HOP OFF" IN THE AIR.

Jumping from a disabled plane with a double parachute. "The pilot parachute opens first, and then withdraws the main parachute from its case."

"The essentials for a good pilot parachute are smallness of area relative to the main parachute, great strength of material, and design and rapid inflation. . . . .

"The writer in practise attaches the pilot to the main by cords from the cable of the pilot to the circumference of the hole in the main. Correctly speaking, the pilot cable should be attached directly to the cable of the main at the point where the lines meet. In this way the load on the pilot parachute would be transmitted direct to the cable of the main instead of through the fabric of the main. But there are obvious practical objections to this.

"The writer has already successfully employed this compound system in his large parachute flares, and to adapt it to life-saving parachutes was merely a matter of modifying details and proportions to suit somewhat different conditions."

In the type of "autochute" shown in the illustrations the main parachute is carried on the aviator's back in a sort of knapsack with a spring lid. The cable connecting it with the pilot is secured to the harness with a spring-bolt, which is either released automatically at once or can be held back at the pleasure of the flier. The method of operation is as follows, as described by Colonel Holt:

"The pilot parachute is withdrawn and held in the hand, and the man gets in a position to jump overboard. The instant before jumping he releases the parachute, which opens as soon as he begins to fall and draws out the main parachute.

WITH PARACHUTE ON BACK.
The aviator is ready for a drop to earth.

"In certain circumstances he may wish to fall for a considerable distance under the pilot parachute only. Thus if he found he was close to the coast and was afraid the main parachute might drift out to sea before it reached the earth, he might wish to fall very quickly to within a few hundred feet of the ground. Or, again, in wartime, if the passenger thought the enemy airmen would attack him with their machine guns while falling, he could drop under the small pilot until near the ground, and then release the main.

"In this case before jumping off he will turn the lever on the harness, thereby locking the release-bolt so that the main parachute is not withdrawn. Until he releases the lever the main parachute will be retained in its receptacle.

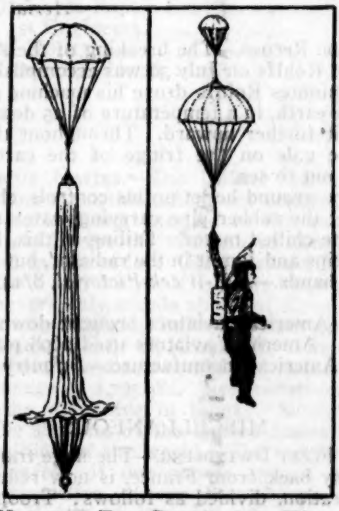
"When falling under the parachute a man is apt to grip and cling on to anything that he can get hold of, and the lever locking this bolt is arranged in such a way that he cannot do this, and the moment he lets go of the lever the bolt will be released.

"At the moment the cords become taut the strain falls on the pilot parachute, which acts as a brake on the whole system and lessens the shock when the main parachute opens to full expansion a moment later. Thus

the shock due to the coming into action of the parachute system is divided into two portions separated by a fraction of time from one another. For this reason it seems probable that shock-absorbers will be quite unnecessary in the compound parachute system. The relative proportion of the two shocks depends chiefly on the relative sizes of the two parachutes . . . .

"There is much less suction from the aperture at the apex or the center of the parachute than there is with a single parachute, the reason being that during the withdrawal of the main parachute there is hardly any motion of translation of this parachute beyond a leisurely fall of a few feet per second, due to its weight acting on the pilot parachute.

"This suction is one of the greatest dangers in connection with parachutes, as it causes a vacuum between the folds of the parachute and effectually prevents its opening. But even such small amount of suction as might be present is entirely eliminated by the device the writer has adopted of closing the central hole with a disk of specially flexible paper.



HOW THE TWO PARACHUTES WORK.
In "parachuting from a plane."

This is arranged to be easily replaced each time after use. It remains intact till the pressure inside the parachute becomes sufficient to burst it. With this arrangement and the system of tubes already described it matters very little how the parachute is folded, and nothing in the nature of skilled attendance is necessary."—*Literary Digest*, 8/2.

99 PER CENT OF AIR SERVICE EQUIPMENT READY TO USE.—The following statement was issued by the statistics branch, General Staff, War Department:

The latest reports from the Air Service show over 4500 active type planes and over 15,800 active type engines at fields and depots, of which 99 per cent are in condition to use.

In the following tables are shown the status of the planes and engines at the Air Service fields and depots as of June 30, 1919:

	Total	In condition to use	Per cent of total in condition to use
Planes			
Experimental	346	346	100
Active	4,547	4,488	99
Obsolete	1,865	1,854	99
Obsolescent	2,670	2,544	95
Total	9,428	9,232	98
Engines			
Active	15,823	15,788	99.8
Obsolete	2,865	2,822	98
Obsolescent	10,457	10,117	97
Experimental	993	945	95
Total	30,138	29,672	98

—*Aerial Age Weekly*, 8/25.

AMERICAN ALTITUDE RECORD.—The breaking of the American official altitude mark by Roland Rohlfs on July 30 was accomplished under great difficulties. For thirty minutes Rohlfs drove his machine at 150 miles an hour, 30,000 feet above the earth, in a temperature of 25 degrees below zero, in a vain effort to send it further upward. Throughout this period his motor was chilled, and the gale on the fringe of the earth's atmosphere was steadily driving him out to sea.

Six miles above the ground he let go his controls, climbed over the cowl, and attempted to cut the rubber pipe carrying water to his radiator in an effort to warm up the chilled motor. Failing in this, he next attempted to cut up a pillow in strips and jam it in the radiator, but the violent wind tore the strips out of his hands.—*Mid-Week Pictorial*, 8/14.

AVIATION FACTS.—American aviators brought down 755 enemy craft in action and lost 357. American aviators used 2698 planes at the front, of which 667 were of American manufacture.—*Infantry Journal*, September, 1919.

MISCELLANEOUS

TROOP TRANSPORT FLEET DWINDLING.—The huge transatlantic fleet, which transported our army back from France, is now reduced to 903,000 deadweight tons, in operation, divided as follows: Troop transports, 871,000; refrigerators, 6000; cargo vessels, 16,000. There are out of operation, awaiting redelivery, 213,000 tons to be turned over to the Shipping Board, the War Department announced.

"With the exception of a few of the faster ships," the Department said, "transports are now being redelivered as they arrive from overseas. Since August 1, 34,000 deadweight tons have been redelivered to the Shipping Board and 2000 to the navy. This brings the total army tonnage redelivered to date to 2,976,000 tons."—*The Nautical Gazette*, 8/23.

NEW ARMY TRANSPORTS.—The former navy transport *Great Northern*, now assigned as an army transport, sailed from Hoboken, N. J., August 24 for San Francisco, where she and her sister ship, the *Northern Pacific*, will be used in permanent transport service on the Pacific. Their regular route will be from San Francisco to Honolulu, Manila, Vladivostock and thence to Nagasaki, Guam, Honolulu and San Francisco. When the American forces are brought out of Siberia they will take passage on these ships, which are fast ones, having a speed of 23 knots. They are equipped with Parsons turbines and burn oil fuel. They will be able to make the trip from San Francisco to Manila in 15 days, thus improving the mail service between those ports. The *Great Northern* and

Northern Pacific were purchased by the army from the Great Northern Railroad Company at the outbreak of the war and were operated by the navy as troop transports during the war.—*Army and Navy Journal*, 9/6.

MAKE-UP OF AMERICAN FORCE THAT WILL STAY IN GERMANY.—General Pershing has advised the War Department that the American forces which will remain in Germany after September 30 will consist of a little more than 6000 picked men. The names of the units and their approximate strength were disclosed by the War Department to-day, as follows:

	Officers	Men
8th Infantry	114	3,720
7th Machine Gun Battalion	16	379
2d Battalion, 6th F. A.	20	620
35th Field Signal Battalion	15	473
1st Supply Train	16	485
1st Mobile Ordnance Repair Shop	3	45
Company A, 1st Engineers	6	250
Field Hospital No. 13	6	82
Ambulance Company No. 26	5	153
Total	201	6,207

—*N. Y. Times*, 8/23.

STANDING OF VARIOUS NAVIES.—The United States Navy Year Book, just issued, shows among other things that our country is easily the second naval power of the world, being excelled in this respect only by Great Britain. The tables which give the strength in fighting ships show that the great powers stand in this order: Great Britain, United States, Japan, France, Germany, Russia and Italy. It is more than probable that at the present moment, however, Italy stands ahead of Russia, as the Bolsheviki lost some of their principal fighting units in recent engagements with the British in the Baltic and the Gulf of Kronstadt. The total number of the ships of all types, combatant and non-combatant, in the United States Navy is 778, with a total tonnage of 1,795,481. New construction now under way will greatly reduce the difference in tonnage between the British and American navies. The showing of the United States is reassuring in the present disturbed condition of the world. The number and power of the ships guarantee the safety of our shores against any possible future aggression, and the protection of our ocean-borne commerce in every quarter of the world.—*Mid-Week Pictorial*, 9/4.

SEEKS LION'S SHARE OF GERMAN SHIPS.—That Great Britain intends to insist upon having 2,250,000 tons of the 3,000,000 tons of German shipping to be divided among the Allies by the reparation commission after the ratification of peace is the statement made to the *Daily Mail* by an official of the Ministry of Shipping, who added that the position was delicate and complicated, and that intricate international negotiations were yet to be completed. Nevertheless, he was confident that Great Britain ultimately would obtain approximately what she demanded. Even then her loss in shipping during the war would exceed 5,000,000 tons.

Discussing complaints by the British ocean-carrying trade that other countries were benefitting at Great Britain's expense through the allocation of ships surrendered by the armistice, the official said this was the fortune of war. The Americans, he added, undoubtedly came out very well on paper, but it should be remembered that the ships in question were passenger ships and consequently bulked larger in the public mind than the cargo ships. Great Britain had a very large fleet of former German cargo carriers actively employed.—*N. Y. Times*, 9/11.

"BREMEN'S" FATE A MYSTERY.—There is no truth in the report that the crew of the German commercial submarine was captured during the war and returned recently to Germany, according to official information given the correspondent to-day. It was added that the British Admiralty has no knowledge concerning the fate of the *Bremen*, but that it is assumed she foundered while endeavoring to cross the Atlantic.

The report of the return of the crew of the *Bremen* to Germany was circulated on August 11 by the *Vossische Zeitung* of Berlin, which declared the men had reached Bremen. According to this newspaper the British had kept the crew prisoners, completely isolated from the world, so that the whereabouts of the missing submersible might remain a secret. Several days later official denial was made in Berlin that the crew of the submarine had arrived in Bremen.

With the British Admiralty disavowing knowledge of the *Bremen* it seems likely that the fate of this underwater craft will remain one of the mysteries of the war. The *Bremen* is supposed to have left Kiel for the United States in the early summer of 1916 with a cargo of dyes and chemicals. Since then her fate has been the subject of innumerable conjectures. At different times the vessel was reported as being on the eve of arriving at various American ports. As many times she was declared to have been captured or sunk by the British. Still further speculation ventured the theory that the *Bremen* had never sailed from Germany.—*N. Y. Times*, 8/27.

COMMONWEALTH DRYDOCK AT BOSTON—LARGEST OF ITS TYPE.—The new Commonwealth Drydock at South Boston is the largest drydock of its type in the world. There may be floating drydocks which are larger, but there are no land drydocks of greater size. It is situated off the main ship channel in South Boston, and is ideally located, both as to the harbor entrance and to the New Haven Railroad yards. The Navy Department has agreed to buy this drydock, when it is completed, from the state on a cost plus basis. At the present time it is 95 per cent completed.

The particulars as to dimensions are as follows: Length at bottom, 1170 feet; width at bottom, 114 feet, 9 inches. Depth over sill at low water, 35 feet. The size of the largest vessel which it could accommodate is 1150 feet in length; beam, 115 feet; draft, 45 feet, high water. It is built of concrete side walls with complete granite facings. It has a floating steel caisson which is brought into place by electric winches. The length of the caisson is 138 feet, 6 inches; width, 27 feet; depth, 53 feet, 6 inches.

It has been approximately under construction for the last three years, but during the war building was considerably curtailed by the shortage of material and labor. It is understood that the navy plans to make the drydock the biggest ship repair plant on the Atlantic coast and the repair plant is to be built alongside of the dock.

It is also understood that the navy plans to build docks adjacent to this dock for berthing ships. The channel leading to the drydock from the main ship channel has a mean depth of 37 feet, and the state, before turning the dock over to the Navy Department, will dredge a turning basin outside. The time required to flood the dock is one hour. The time required to empty it is approximately three hours. The dock has a capacity of approximately 50,000,000 gallons of water. The emptying machinery is five centrifugal pumps operated by electricity. The dock is emptied and filled through a series of conduits having outlets in the floor of the dock. The five Worthington pumps, composed of three large and two small drainage pumps, have a capacity of 4080 horsepower. Other facilities which the dock will have include enormous cranes, a modern ship repair plant including machine shops, carpenter shops, etc.

An extra sill has been provided near the center of the dock. The inner dock will take a vessel 635 feet long; the outer dock one 490 feet long.

The drydock in addition to its ideal location with relation to the sea, is within a stone's throw of the new army base at South Boston, the second largest army base in the country; which has just been completed and cost approximately $28,000,000. The army base is on a reserve channel in an inlet; so that steamers docking or leaving the new dock will not be interfered with by vessels going to or from the army base. A quarter of a mile away is the new State Fish Pier and Commonwealth Pier, the largest passenger and freight pier in the world. All of these piers and docks are built on made land filled in by the state, and there are wonderful possibilities of further development. In fact, it is safe to say that there is no collection of docks and piers in the world which would more readily lend itself to expansion than these Commonwealth projects in South Boston.—*Scientific American*, 8/9.

DELIVERING MAIL TO STEAMER AFTER IT HAS SAILED.—One of the contemplated uses of the airplane in peace time is that of overtaking steamers at sea for the purpose of placing delayed mail aboard. Obviously, the speed of the average airplane makes it possible to overtake a steamer several hours after it has left the port, thereby extending the mail service time that many hours.

It has also been suggested that steamers might carry small airplanes which, when the steamer neared port, might fly with bags of mail. If airplanes were employed to overtake the steamer, and one or more airplanes employed to make port some hours before the steamer, perhaps eight hours or more might be saved in trans-Atlantic mail service. However, such a scheme would call for a considerable number of machines and pilots, and would entail a notable expense.—*Scientific American*, 8/23.

WEST POINT DEATHS LED.—Analysis of the "final" casualty report received from the central records office in France shows that the European war was the most sanguinary in history.

Battle deaths among American enlisted men average 8 per thousand, among emergency officers 11 per thousand, and among regular army officers 14.

Of every 1000 officers landed in France, 330 were killed or wounded. Battle deaths were 37 per thousand for graduates of West Point against 18 for non-graduates.—*Infantry Journal*, September, 1919.

CURRENT NAVAL AND PROFESSIONAL PAPERS

Aftermath of War: (1) The Teaching of History, and its Consolations. By J. A. R. Marriott, M. P. (2) Hard Times Ahead. By J. Ellis Barker. *The Nineteenth Century and After*, August, 1919.

Torpedo-Boat Destroyers in the Making. By Commander James Reed, U. S. Navy. *Mechanical Engineering*, September, 1919.

Pulverized Coal as a Fuel for Boilers. By Edward R. Welles and W. H. Jacobi. *Mechanical Engineering*, September, 1919.

On Erosion of Guns. By Masatosi Ôkôchi. *Journal of the College of Engineering*, Tokyo Imperial University, March 31, 1919.

Dazzle Painting of Ships. By Lieut. Comdr. Norman Wilkinson, R. N. *North-East Coast Institution of Engineers and Shipbuilders*, Advance Proof, July 10, 1919.

DIPLOMATIC NOTES

FROM AUGUST 15 TO SEPTEMBER 15

PREPARED BY

ALLAN WESTCOTT, Associate Professor, U. S. Naval Academy

THE PEACE TREATY BEFORE THE U. S. SENATE

FOREIGN AFFAIRS COMMITTEE REPORTS FOR RESERVATIONS.—The Senate Committee on Foreign Relations returned the Peace Treaty to the Senate on September 10, with a majority report recommending four reservations all relating to the League of Nations, and four amendments. The majority report condemned the League plan on the ground that "as it stands it will breed wars instead of securing peace." Furthermore, the report reads, "when we are once caught in the meshes of a treaty of alliance or a League of Nations composed of 26 other powers, our freedom of action is gone." The proposed reservations read as follows:

Resolved (two-thirds of the Senators present concurring herein), That the Senate advise and consent to the ratification of a treaty of peace with Germany, signed by the plenipotentiaries of the United States and Germany and by the plenipotentiaries of the 27 Allied and Associated Powers at Versailles on June 28, 1919, with the following reservations and understandings to be made a part and a condition of such ratification, which ratification is not to take effect or bind the United States until the said following reservations and understandings have been accepted as a part and a condition of said instrument of ratification by at least three of the four principal Allied and Associated Powers, *to wit*: Great Britain, France, Italy, and Japan:

1. The United States reserves to itself the unconditional right to withdraw from the League of Nations upon the notice provided in Article 1 of said treaty of peace with Germany.

2. That the United States declines to assume, under the provisions of Article X, or under any other article, any obligations to preserve the territorial integrity or political independence of any other country or to interfere in controversies between other nations members of the League or not, or to employ the military or naval forces of the United States in such controversies, or to adopt economic measures, for the protection of any other country, whether a member of the League or not, against external aggression or, for the purpose of coercing any other country, or for the purpose of intervention in the internal conflicts or other controversies which may arise in any other country, and no mandate shall be accepted by the United States under Article XXII, Part 1, of the Treaty of Peace with Germany, except by action of the Congress of the United States.

3. The United States reserves to itself, exclusively, the right to decide what questions are within its domestic jurisdiction and declares that all domestic and political questions relating to its affairs, including immigration, coastwise traffic, the tariff, commerce, and all other domestic questions, are solely within the jurisdiction of the United States and are not under this treaty submitted in any way either to arbitration, or to the considera-

tion of the council or of the assembly of the League of Nations, or to the decision or recommendation of any other power.

4. The United States declines to submit for arbitration or inquiry by the assembly or the council of the League of Nations, provided for in said Treaty of Peace, any questions which in the judgment of the United States depend upon or relate to its long-established policy, commonly known as the Monroe Doctrine: said Doctrine to be interpreted by the United States alone and is hereby declared to be wholly outside the jurisdiction of said League of Nations and entirely unaffected by any provision contained in the said Treaty of Peace with Germany.

PROPOSED AMENDMENTS.—The changes urged by the majority of the committee in its report involve these amendments:

1. To equalize the vote of the United States and Great Britain and her colonies and dominions in the League of Nations. This was offered by Senator Johnson.

2. To provide that nations which are parties to a dispute shall not vote in the adjustment of it in the League Council. This was offered by Senator Moses.

3. To restore the former German privileges in the Shantung Peninsula to China, instead, as the treaty provides, giving them to Japan, this being sponsored by Senator Lodge.

4. To eliminate the United States from participation in all the commissions created under the treaty with the exception of the Reparations Commission, the American delegate to vote, on that commission, only on matters involving international shipping, except as expressly instructed, when occasion arises, by his own government. This affects 35 parts of the treaty, but is embraced in one amendment, offered by Senator Fall.

MINORITY REPORT.—The report of the Democratic minority of the Senate Committee was submitted on September 11. It argued that the amendments and reservations proposed by the majority would defeat the treaty, and would result in the sacrifice of a large number of advantages secured from Germany by a dictated peace.

VIEWS OF THE PRESIDENT.—The view of the minority was in accord with those of the President as expressed in a conference with members of the Committee at the White House on August 19. Relating to reservations, he said:

"It has several times been suggested, in public debate and in private conference, that interpretations of the sense in which the United States accepts the engagements of the covenants should be embodied in the instrument of ratification. There can be no reasonable objection to such interpretations accompanying the act of ratification provided they do not form a part of the formal ratification itself. Most of the interpretations which have been suggested to me embody what seems to me the plain meaning of the instrument itself.

"But if such interpretations should constitute a part of the formal resolution of ratification long delays would be the inevitable consequence, inasmuch as all the many governments concerned would have to accept in effect the language of the Senate as the language of the treaty before ratification would be complete. The assent of the German Assembly at Weimar would have to be obtained, among the rest, and I must frankly say that I could only with the greatest reluctance approach that Assembly for permission to read the treaty as we understand it, and as those who framed it quite certainly understood. If the United States were to qualify the document in any way, moreover, I am confident from what I know of

the many conferences and debates which accompanied the formulation of the treaty that our example would immediately be followed in many quarters, in some instances with very serious reservations, and that the meaning and operative force of the treaty would presently be clouded from one end of its clauses to the other."

The President began a speech-making tour of the country with addresses in Ohio on September 4, advocating adoption of the Treaty without changes.

FRENCH DEPUTIES FAVOR RATIFICATION.—As a result of debate in the French Chamber of Deputies early in September, it became clear that a majority of at least 350 favored ratification of the Peace Treaty with Germany. A minority of not more than 100, consisting chiefly of radical socialists were opposed to ratification.

AUSTRIAN PEACE TREATY SIGNED

On September 10, the Austrian Peace Treaty was signed at St. Germain by representatives of Austria and of the Allied and Associated Powers. The treaty, as handed to the Austrian delegates on September 2 and accepted by the Austrian Assembly, was altered but slightly from the terms originally presented.

In answer to Austrian counter proposals, the Supreme Council at Paris upon again handing the treaty to Austria, reiterated the share of the Austrian people in responsibility for the war.

RUMANIA AND CZECHO-SLOVAKIA REFUSE TO SIGN.—Upon failure of the Peace Conference to permit signature with reservations, both the Rumanian and the Czecho-Slovak delegates refused to sign the Austrian Treaty. The reasons in each case were the commercial restrictions and the guarantees to racial minorities imposed by the treaty in territories taken from the old Austro-Hungarian Empire. The chief reasons submitted by Rumania in a letter to the Council were:

First, that Article LX of the treaty held their hands commercially and economically at a time when they required absolute freedom of action in order to accomplish reconstruction; and, second, that guarantees to minorities imposed by an outside power would take away Rumania's sovereignty over newly annexed territories.

CABINET CHANGES IN BALKANS.—Paris, Sept. 11.—The governments of the only two delegations that refused to sign the Austrian Peace Treaty have resigned. Consequently the future attitude of Rumania and Jugo-Slavia on questions involved depends upon the policies adopted by the Ministries to be organized in Bucharest and Belgrade. The delegations of both countries have been given until Saturday to obtain instructions from the new Cabinets.

The Supreme Council holds that Rumania will lose Bukowina if she does not sign the Austrian Treaty which allots that territory to her. Similarly she will lose Transylvania unless she signs the proposed treaty with Hungary.

Reports that Rumania was negotiating for a separate peace with Hungary were positively denied to-day by the Rumanian Press Bureau here.

Take Jonescu is said to be organizing a new government at Bucharest.—*N. Y. World*, Sept. 12, 1919.

AUSTRO-GERMAN UNION BARRED

On September 8 the Supreme Council at Paris notified Germany that Article 61 of the German Constitution ratified on August 11 violated Article 80 of Section VI of the Peace Treaty, and that unless the article were nullified within 15 days the Allied and Associated Powers would order an extension of their occupation on the right bank of the Rhine.

The article in question provided for admission of Austrian delegates to the German Reichstag, whereas Article 80 of the Peace Treaty with Germany required that Germany "respect strictly the independence of Austria . . . . inalienable except with the consent of the Council of the League of Nations."

Germany replied on September 5 that she thought consent had been given to a spontaneous Austro-German Union. A later note delivered by the Council to Germany on September 11 in effect demanded that Germany submit a written statement accepting the Peace Treaty as transcending Article 61 of the Constitution.

HUNGARY

ARCHDUKE JOSEPH RESIGNS.—On August 23 the Archduke Joseph resigned, as the result of an ultimatum sent by the Paris Council notifying Hungary that the Allied and Associated Powers would negotiate only with a cabinet representing all parties. An accompanying telegram gave the Archduke two hours in which to vacate his office. Premier Friederich then organized a new cabinet composed chiefly of former members of the overthrown Peidl ministry.

ALLIED REPROOF TO RUMANIA.—On September 8 Sir George Clerk of the British Foreign Office was sent to Bucharest by the Paris Council with a note demanding that Rumania speedily evacuate Hungary, cease requisitioning supplies, and submit an account of material previously seized.

Premier Bratiano of Rumania, in communications on September 5 to the Rumanian representative in Paris, denied that he had received any of the numerous messages sent by the Paris Council in the preceding two weeks. He expressed the opinion that "in destroying Bolshevism in Hungary Rumania had rendered eminent service to the Allied cause," and that if the hostile policy of the Council toward Rumania continued, Rumania might cease all military support in Russia and elsewhere.

TURKEY AND THE NEAR EAST

BULGARIA TO GET TREATY.—It was announced from Paris on September 12 that the Bulgarian Treaty would probably be handed to that nation's representatives on September 16. The treaty, according to Paris reports, will promise Bulgaria an unnamed port on the Ægean, but will leave the disposition of Thrace for later discussion.

GREECE OPPOSED TO THRACIAN SETTLEMENT.—Keen disappointment was expressed by Greek delegates in Paris regarding the disposition of Thracian territory proposed the last of August by Mr. Wilson.

There is no question that the adoption of this plan cabled over by President Wilson last week as his own substitute for the Polk and Tardieu plans would discredit Venizelos with his own people beyond hope of recovery. Out of all Thrace the President would give Greece only a very small niche in the extreme southwest corner of Western Thrace, a district with 40 miles of coast line and running back from the coast about 30 miles. Furthermore, Mr. Wilson would give to Bulgaria all the northern part of Western Thrace, as well as the northwestern part of Eastern Thrace. All the rest of Eastern and Western Thrace would be given by the Wilson plan to the international State of Constantinople, under the mandate of some great power.—*N. Y. Times*. Sept. 6, 1919.

AMERICAN ADMIRAL HIGH COMMISSIONER IN TURKEY.—Washington, August 28.—Secretary Lansing to-day confirmed the report that Rear Admiral Mark L. Bristol, the American High Commissioner in Turkey, had protested to the Turkish Government against the killing of Armenians by Turks.

Mr. Lansing would not comment further on the statement beyond saying that this was in line with the action of the American Government several times during the past few years in protesting, in the name of humanity, to the Ottoman Government against the killing of Armenians. He declined at this time to go into the precise nature of the instructions which had been sent to Admiral Bristol.

The State Department announcement reads:

"Rear Admiral Mark L. Bristol, U. S. N., has been appointed High Commissioner of the United States at Constantinople. He will be in charge under the direction of the Department of State of political matters at Constantinople.

"Mr. Ravndal, who retains his title of Commissioner and Consul General, will continue in charge of commercial and similar matters at Constantinople. In political matters he will be under the direction of the High Commissioner."—*N. Y. Times, Aug.* 29, 1919.

ANGLO-PERSIAN TREATY OPPOSED.—Washington, Aug. 29.—The recently signed Anglo-Persian treaty has been submitted to the American State Department by the British Government, which has sounded out the attitude of the Washington Government toward the arrangement.

The State Department is understood to have made a reply in which it indicated that the American Government did not look with favor upon the treaty. There was an unconfirmed report to-night that the State Department has declined to recognize it.

The first agreement was political in character and promised the cementing of the Anglo-Persian ties and promotion of the progress and prosperity of Persia. According to this agreement, Great Britain agreed in the most categorical manner to respect the integrity and independence of Persia, to supply expert advisers for the Persian administration to be engaged on contract and endowed with adequate powers, to supply at Persia's cost such officers, munitions, and equipment that might be adjudged necessary by a joint Anglo-Persian commission of military experts for a uniform Persian force to preserve order, to prescribe a loan for these purposes, to co-operate with the Persian Government in railway construction and other forms of transport, and finally both governments agreed to the immediate appointment of a joint committee to examine and revise the existing customs tariff.

The second agreement related to a loan of £2,000,000 at 7 per cent, redeemable in 20 years, and to be secured on the revenues and customs reserved and assigned for the repayment of the 1911 loan. Should these prove insufficient Persia, under the agreement is to make good the difference from other sources of revenue. Article V of the Anglo-Persian agreement of 1911 is included in the understanding.—*N. Y. Times*, Aug. 30, 1919.

ITALY

FIUME SETTLEMENT REPORTED.—Paris, Sept. 3 (Associated Press).—Satisfaction is expressed in Italian circles at the outcome of Signor Tittoni's trip to Deauville, from which place he returned yesterday after a conference with the British Prime Minister, David Lloyd George.

While no official communication has been given out, it is learned from reliable authority that an agreement has been reached from which a solution of the Italian problem is expected. According to this information the three governments which are parties to the Treaty of London have decided to send a collective note to President Wilson asking him to give his assent to a compromise which the signatories consider adequate.

Some doubt is expressed, however, as to the probability of President Wilson modifying his attitude on the Adriatic question, but it is said that the compromise opens the way for the President to agree without receding from his former position.—*N. Y. Times,* Sept. 4, 1919.

RUSSIA

MORRIS FAVORS RECOGNITION OF KOLCHAK.—Washington despatches of the close of August stated that the reports of Japanese Ambassador Roland S. Morris, recently returned from an investigation of conditions in Russia, strongly recommended recognition of the Kolchak Government, and declared that had Kolchak been recognized three months ago he would have established himself firmly in power.

The reverses suffered by the Kolchak forces, however, together with the opposition expressed to the participation of American forces in Russia, made such recognition very unlikely.

FAR EAST

JAPANESE REFORMS IN KOREA.—Washington, Aug. 20.—The Japanese Embassy to-day received and made public the texts of an imperial rescript and a statement by Premier Hara, issued in Tokyo yesterday, announcing the abolition of military administration in Korea and the introduction of a civil administration. It is specifically declared by the Premier "that Korea, and Japan proper, forming equally integral parts of the same empire, no distinction should, in principle, be made between them, and it is the ultimate purpose of the Japanese Government, in due course, to treat Korea as in all respects on the same footing with Japan proper."

The system of gendarmerie in Korea is to be replaced by a force of police to be placed under the control of local governors, just as in Japan proper. It is stated that the disturbances which broke out in Korea last March retarded the introduction of the reforms. Two civilians, Baron Saito and Mr. Midzuno, have been appointed respectively Governor General and Director General of administration.—*N. Y. Times,* Aug. 21, 1919.

On August 31 leaders of the agitation for Korean independence, "representing and acting in behalf of more than 19,000,000 Koreans," issued a proclamation declaring Korea a republic.

RESIGNATION OF MINISTER REINSCH.—A Washington despatch of August 27 reported the resignation of Dr. Paul S. Reinsch, American Minister to China. His resignation was attributed to failure of the American delegates at Paris to carry out his promises to China.

MEXICO

AMERICAN WARNING TO MEXICO.—According to information published by Secretary Lansing on August 14 the United States representative in Mexico handed the following note to the Mexican Government:

Sir: With reference to the Embassy's note, dated July 16, 1919, relative to the murder of Peter Catron, near Calets, San Luis Potosi, on or about July 7 last, I have the honor to inform you that I am now under telegraphic instructions from my government to urge upon the Mexican Government the punishment of those responsible for this murder and the adoption of adequate measures to prevent a recurrence of the murder of American citizens.

I am also instructed to state that should the lives of American citizens continue to remain unsafe and these murders continue by means of the unwillingness or inability of the Mexican Government to afford adequate protection, my government may be forced to adopt a radical change in its policy with regard to Mexico.

Accept, Sir, the renewed assurances of my highest consideration.

(Signed) GEORGE T. SUMMERLIN.

CARRANZA YIELDS ON FOREIGN CLAIMS.—Mexico City, Aug. 30.—Important concessions were made by President Carranza to-day in issuing a decree amending the law on claims. Briefly they are as follows:

Claims for damages may be presented not only for losses during the recent two revolutions ending with the installation of the present government on May 1, 1917, but for those sustained since then in various regions where revolts are still smoldering.

Damages by rebels or outlaws to person or property subject to claims when such damage is found to be the result of negligence on the part of constituted authority.

A commission on idemnification will admit any means of proof "humanly reasonable." The Claims Commission can consider all cases, but the President has the right to arrange conventions with any foreign power for a mixed commission to handle claims of citizens of that power.

The most important amendment, it is considered, is that relative to the President's power to arrange conventions for mixed commissions with foreign powers.—*N. Y. Times,* Sept. 1, 1919.

NOTICE TO MEMBERS

NOTICE TO MEMBERS

More members, both regular and associate, are much desired. Any increase in membership invariably means larger number of papers and essays submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to some one eligible for membership, urging him to join.

By direction of the Board of Control,

S. A. Taffinder,
Secretary-Treasurer.

Attention is invited to extracts from the constitution on the opposite page as to the requirements in making applications for life, regular and associate membership. Members and associate members are liable for the payment of the annual dues until the date of the receipt of their resignation in writing. Annual dues $2.50.

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To the Secretary and Treasurer,
U. S. Naval Institute,
Annapolis, Md.

Dear Sir:

Please enroll my name as a { *regular* / *associate* } *member of the U. S. Naval Institute from this date.*

Very truly yours,

.....

.....

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-sixth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be two dollars and fifty cents, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, $3.00; enlisted men, U. S. Navy, $2.50. Single copies, by purchase, 30 cents; issues preceding January, 1919, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1920

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original essay on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the essay.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original essays published in the PROCEEDINGS during 1919, which are deemed by the Board of Control to be of sufficient merit, will be passed upon by the Board during the month of January, 1920, and the award for the prize will be made by the Board of Control, voting by ballot.

2. No essay received after November 1 will be available for publication in 1919. Essays received subsequent to November 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best essay published during 1919 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. It is requested that all essays be submitted typewritten and in duplicate; essays submitted written in longhand and in single copy will, however, receive equal consideration.

6. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

S. A. TAFFINDER,
Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ESSAYS

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

"Duties and Responsibilities of Subordinates with Special Reference to the Relations between Commanders-in-Chief and Chief of Naval Operations; Commanders-in-Chief and Force Commanders; Force Commanders and Division Commanders."

"Initiative of the Subordinate—Its True Meaning."

"Military Efficiency Dependent upon National Discipline."

"Governmental Organization for War."

"Naval Gunnery, Now and of the Future."

"Naval Policies."

"The Place of the Naval Officer in International Affairs."

"Moral Preparedness."

"Tact in Relation to Discipline."

"The Principles of Naval Administration in Support of War-Time Operations."

"Responsibilities and Duties of Naval and Military Officers of the United States in Educating and Informing the Public on Professional Matters."

"A Commission in The Navy: Its Meaning and the Obligations Which It Involves."

"The Relations of an Officer to his Subordinate, Both Commissioned and Enlisted."

"The True Meaning of the Expression 'An Officer and a Gentleman.'"

"Seen in the Light of Recent Events, What Should Be the United States Navy of the Future as Regards Types and Numbers of Ships."

"Probable Future Development of Surface-craft, Air-craft and Submarines and the Relation of these Types to Each Other and to Naval Warfare in General."

"The Grand Strategy of the Great War, with Especial Reference to Coördination, and Lack of Coördination, Between Naval and Military Forces."

"The Problems of Overseas Operations in the Light of Recent Developments."

"The Influence of Sea Power upon History as Illustrated by the Great War."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892 By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention 1896. By Lieutenant John M Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of Its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure Its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize, Essay 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Commander A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906 By Pay Inspector J. A. Mudd. U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A Few Thoughts on Our Next Step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut. Commander Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut. Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut. Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut. Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut. Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. N.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. N.

1915

The Rôle of Doctrine in Naval Warfare. Prize Essay, 1915. By Lieut. Commander Dudley W. Knox, U. S. N.

AN AIR FLEET: OUR PRESSING NAVAL WANT. First Honorable Mention, 1915. By Lieut. Commander Thomas Drayton Parker, U. S. N.

TACTICS. Second Honorable Mention, 1915. By Ensign H. H. Frost, U. S. N.

DEFENCE AGAINST SURPRISE TORPEDO ATTACK. Third Honorable Mention, 1915. By Ensign R. T. Merrill, 2d, U. S. N.

1916

The Moral Factor in War. Prize Essay, 1916. By Lieutenant (J. G.) H. H. Frost, U. S. N.

NAVAL PERSONNEL. First Honorable Mention, 1916. By Lieut. Commander J. K. Taussig, U. S. N.

EDUCATION AT THE U S. NAVAL ACADEMY. Second Honorable Mention, 1916. By Lieutenant Ridgely Hunt, U. S. N.

SOME UNDERLYING PRINCIPLES OF MORALE. Third Honorable Mention, 1916. By Commander Dudley W. Knox, U. S. N.

LARGE *vs.* A GREATER NUMBER OF SMALLER BATTLESHIPS. Lippincott Prize Essay. By Lieut. Commander Thomas Lee Johnson, U. S N.

1917

Commerce Destroying in War. Prize Essay, 1917 By Commander Lyman A. Cotten, U. S. Navy.

THE PEOPLE'S RÔLE IN WAR. First Honorable Mention, 1917. By Lieutenant H. H. Frost, U. S. Navy.

THE NATION'S GREATEST NEED. Second Honorable Mention, 1917. By Colonel Dion Williams, U. S. Marine Corps.

1918

Letters on Naval Tactics. Prize Essay, 1918. By Lieutenant H. H. Frost, U. S. N.

THE PREPAREDNESS OF THE FUTURE. First Honorable mention, 1918. By Commander H. O. Rittenhouse, U. S. N. Retired.

NAVAL STRATEGY. Second Honorable Mention, 1918. By Rear Admiral Bradley A. Fiske, U. S N.

1919

MILITARY CHARACTER. First Honorable Mention, 1918. By Captain Reginald R. Belknap, U. S. N.

SOME REFLECTIONS ON THE THREE FACTORS OF BATTLESHIP DESIGN. Second Honorable Mention, 1918. By Lieut. Commander Beirne S. Bullard, C. C., U. S. N.